ELECTRICAL WORLD

ANNUAL PROGRESS AND STATISTICAL NUMBER
JANUARY 3, 1931

THREE DECADES OF PROGRESS

1910 « » 1920

Formation and development of utility and manufacturing units. Pioneering period in organization and operation. Total investment in 1910 was $5,741,000,000 with total « « « « annual revenue of $1,025,000,000 » » » »

1920 « » 1930

Regional and national development of manufacturing and utility groups. Establishment of credit standing, industry cooperation, public policies, organization and holding company. Total investment in 1920 was $12,655,000,000 « « « « with annual revenue of $3,371,000,000 » » » »

1930 « » 1940

Centralization of ownership and operation. Development of national political policies with respect to the industry. Aggressive commercial activity. Total industry investment in 1930 was $23,590,000,000 with an annual revenue of $6,243,000,000. Expectations for 1940 indicate an investment of $32,250,000,000 with annual revenue of « « $8,577,000,000 for the entire electrical industry » »

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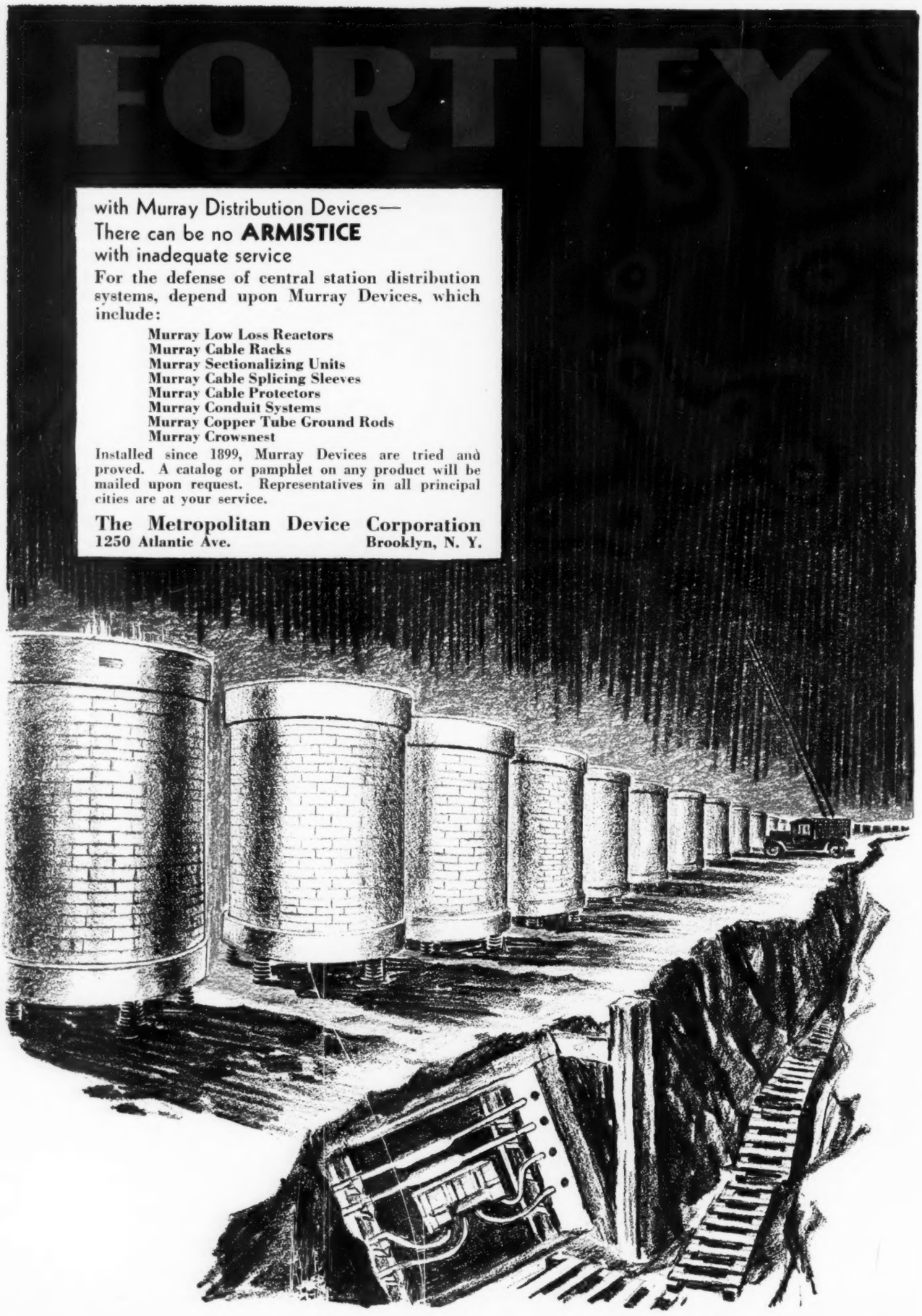

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L. W. W. MORROW, *Editor*

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Chicago
H. S. KNOWLTON
New England Editor
1127 Statler Bldg.
Boston
WALTER C. HESTON
Pacific Coast Editor
883 Mission St.
San Francisco
PAUL WOOTON
Washington
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National Press Bldg.
Washington

JAMES H. RUDD
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ANNUAL PROGRESS AND STATISTICAL NUMBER
JANUARY 3, 1931

IN THIS ISSUE

the editors become prophets. They view the industry on a decade perspective in order to orient this rather poor business year. They believe the perspective and the prophecy are good psychological pills to take.

NO ANGELIC VISITATION

from Heaven came to make the editors prophets. There was a pessimistic approach and a pessimistic reaction when the idea of surveying the industry on a long-time basis was broached—editors do not like to prophesy. It was only after much study and argument that an agreement was reached favorable to the project. They realized the limitations and hazards in dealing quantitatively with the future. But the cause is worthy, the intent is constructive and they believe the readers will realize that the quantitative data on the next decade represent analytical opinions. The future business expectations are thought to be conservative, but, even so, they show possibilities and magnitudes that stagger the imagination and will put great stress on the industry to meet.

BUT A STATISTICAL ISSUE

is a poor device to use as a text for this discussion. This space was meant to be a place for thoughts in lighter vein, comments about authors and articles, inner sanctum announcements about editorial plans and policies—anything about ELECTRICAL WORLD, its editors, contributors and readers that

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might be interesting. For example, we like the cover on this issue; it is smart without being affected, informative without knocking your eye out. We hope to improve our covers greatly this year. Advertisers will co-operate.

THE COMMENT OF EXECUTIVES

in this issue shows there is quality leadership available for the next decade. There is a unanimity of opinion on basic conditions that augurs well for the future. These busy men have an industry point of view; that's why they contribute their sound comments to an industry audience. They speak for aggressive selling, for market analysis, for co-operation, for American wage and living standards. No slipping back.

IN COMPILING STATISTICS

we find a ready response from all groups except the manufacturers. They still believe not and trust not. Even the Department of Commerce put a special crew to work and compiled the 1929 manufacturing census data quickly and the utility groups are very cordial to factual compilations. Of course, there is a tradition and commercial suspicion back of the collection of statistics from manufacturers, but they will sense the great value of the data and compile it some day—at least we urge them to do so and some of their leaders preach the same gospel.

DOMESTIC BUSINESS

is the great stabilizer of the electrical industry. We note the number of executives in both manufacturing and utility groups that point to the home as a major electrical market. Many new acts and thoughts for supplying this market will be recorded this year.

COMMUNICATION GROWS

into many bypaths. To sound is added sight as a commercial opportunity in the offing that bids fair to revolutionize present practices. It is interesting to note what O. H. Caldwell says about radio sales and service. We agree with him that higher power broadcasting is the answer.

SPENDING MONEY

according to the promise to President Hoover has been the habit of the utilities this year. Budgets for next year are also large. This means employment for labor and business for industry. We hope the money market will not put a damper on budget expenditures.

THE YEAR AHEAD

brings problems and opportunities to the electrical industry. Sales to available markets, economy in operation, improvements in the art, development of better public relations, raising money for expansion—these and many other topics come to mind. We have an editorial program that we believe will help the industry.

▼

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Cable address, "MACHINIST, N. Y."

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ELECTRICAL WORLD

for the Week Ending

January 3, 1931

Electrical industries face a future even better than their amazing past

1930 output below 1929; utility gross revenues higher

1931 is a year in which to lay the foundation for future prosperity. This means modernization of machines, methods, markets and men and applies not only to the manufacturing end of the business but to the engineering, research and selling ends as well.

CLARENCE L. COLLENS,
President N.E.M.A.

—$2,000,000,000 for equipment is 1931 outlook value of new electrical apparatus. Beyond that it's hard to foretell. Almost anything may be just over the horizon to boost the figure—*p. 33.*

—Plant raised by 2,000,000 kw. as new construction brings nation's central-station generating facilities to a 32,000,000 kw. total. Three-fourths of prime movers are steam-driven—*p. 53.*

—1931 budget to be $894,000,000. This year's capital expenditures will nearly equal 1930's as electric utilities continue to build with confidence in an early return of prosperity and increased demand for energy—*p. 49.*

—Development of today's trend will mean vast new markets for energy and equipment in electrical field. Many straws in home and industry use of energy show the way—*p. 9.*

—Merger movement is waning largely because there are fewer properties left to merge; 1930 shows a rapid culmination of the consolidation era of the power companies—*p. 61.*

Nowhere in the light and power business have we seen any diminution of faith or courage in the future of American business, and no industry in America has done more to insure the speedy return of satisfactory business conditions.

W. ALTON JONES,
President N.E.L.A.

—Utilities fared well in 1930 when the electric and other industries are compared. While energy sales fell off, year ended with 2 per cent increase in gross revenue for them—*p. 27.*

—Stock values off six billions as security market reaction of past fifteen months gives up futures as dominant factor and makes dividend year bear the burden of market price—*p. 72.*

NEWS

OF THE WEEK

Industry Faces 1931 Undaunted—
Utilities Kept 1930 Promises

HAVING in every major respect kept the faith in their promises made to President Hoover early in 1930 to spend substantially a billion dollars on new construction and improvements, the leaders of the electric light and power industry are prepared and determined to continue their established construction, engineering, sales and service policies in the year now beginning, according to recent reports to the ELECTRICAL WORLD. The capital expenditures for 1930 totaled, roughly, $960,000,000.

$894,000,000 is 1931 budget

A thorough and careful check made directly with the leaders of the electric light and power industry indicates that a total of $894,000,000 will be budgeted by their organizations for new plant and equipment this year. Fuel-burning stations will get, roughly, 23 per cent of this, hydro stations 12 per cent, transmission 13 per cent, distribution and substations 46 per cent and miscellaneous expenditures 6 per cent. These estimates are based on definite statements totaling $819,000,000, and the balance was computed from averages and probable expenditures of non-reporting properties. Hoover Dam figures were not included. This does not look like much of a slump in 1931 for the electrical industry. It is the second largest budget in its history; 1930 had the largest.

Taking a longer time view of the situation, 1940, if trends and probable developments and new markets and adequate merchandising campaigns are sustained, should see electric light and power a $19,000,000,000 industry. It is only $12,000,000,000 now and was but $5,000,000,000 ten years ago.

$2,000,000,000 for manufacturers

Electrical manufacturers, in spite of the depression, hysteria and stock market of 1930, did not fare badly either. About the same value of manufactured products as in 1928, according to census figures, and that is only 10 per cent less than in the aggregate roaring, boom days of 1929. Not bad. No, not at all,

Wide World Photos

The American people never do anything by halves. When things are looking up we are not satisfied with a normal prosperity. We want to have it on a constantly ascending scale. We become exalted and declare that poverty can never touch us. When the picture changes we are never content with a baby depression. We insist that it shall be man-sized, shall be thoroughgoing and complete. If the sun is shining we demand that it shall shine so strongly as to scorch us. If the clouds gather we accept nothing less than a gloom that is thicker than a London fog.

THOMAS W. LAMONT,
Partner
J. P. Morgan & Company

and 1931 ought to be every bit as good, or better. Why? Well, there is a slow start likely, to be sure, but plans are under way for aggressive merchandising of appliances and fully electrified homes. Building will be coming back before the year is half done and jobber and dealer supplies are ridiculously low. A revival of general business will find electrical products in quick demand, in any event.

U. S. Census figures take a long time to grind out. The latest almost-complete figures are for 1929. Radio apparatus led then, with a value of $342,000,000. Insulated wire and cable came next, with $296,000,000, and then came $168,000,000 for generators, motor-generators, etc. All but last and least came household appliances with $76,000,000, and if the industry acts wisely there will be an improvement there. The ultimate consumer is the one to whom the electrical equipment should go in large volumes. And it will—with the fully electrified home. Of course, if one combines figures for appliances and lamps this outlet predominates now, to say nothing of the margin that radio adds.

Electrical manufacturing is now a $2,150,000,000 industry, with the value of annually manufactured products almost equaling the capital invested. By 1940 there will probably be $2,750,000,000 invested here. It is hard to prophesy here, though, for too many unknown elements may enter to boost the figure to undreamed-of levels.

33,860,000 kw. installed capacity

As of the end of 1930 the public utility power plants of this country had a total installed capacity of 33,860,000 kw., of which 24,550,000 kw. was in steam, 8,902,000 kw. was in hydro power and 400,000 kw. was driven by internal-combustion engines. These figures represent a rise in plant capacity of 2,800,000 kw. during 1930, and 2,100,000 kw., almost as much again, is due for completion this year. Depression times have not affected the utility plant construction programs at all seriously. As trends go at present, the construction of steam plants is double that of hydro stations. More than half of the steam plant construction during 1930 represented additions to existing stations, while virtually all hydro expansion was in new stations, merely a difference in policy to operating expediency, it seems.

Half a million new customers

About 86 per cent of American urban families have electric service. During 1930 half a million new customers were added, but the rate of increase is slowing down. The total number of customers when plotted against the total number of families shows the latter curve to approach the former as an asymptote. Here 1930 was not so good,

for of the growth normally to be anticipated of 800,000 domestic customers, only slightly more than half materialized. The industrial depression took its toll.

Rural service expansion continues apace and 1930 saw an increase of 21 per cent here, representing a growth of 120,000 electrified farms, the largest since the rural electrification movement began.

Great merger era is over

As the electric light and power industry outgrows the adolescent stage and settles down, the exciting days of many mergers and acquisitions of holding companies and local operating organizations give place to quieter ones. There are only 40 companies that can truly be identified as "top" holding companies now, and even there overlapping occurs. The next step is to consolidate these holding companies, as the local operating-property lambs are pretty well worked in to one fold or another. During 1930 very few large corporate changes occurred.

Back to senior financing

Financing the future expansion of the industry continues as the major problem of the top executive. The trend now, due to investment market conditions, is toward senior security issues; 1930 saw a distinct and definite falling off of stock issues. Last year's new money was substantially the same as in 1929, $1,500,000,000. The depression has turned a mean trick or two here, but, as usual, the strong organizations find it easier to float their securities than do the weaker ones.

During the next decade $11,000,000,000 has got to come from somewhere for new investment, and a $4,000,000,000 addition for refunding makes the capital-raising program of the industry a task of stupendous proportions. Many factors are favorable. The credit position of the industry is good, capital structures are sound, well balanced and flexible.

The method and the means of raising the enormous amount of capital needed in the next decade are adequate. Undoubtedly utility securities will settle down to a rather stable market price and earning value in this coming period. The credit position maintained will determine the volume of investment funds that can be attracted to the electric utilities in competition with other industries.

Six billion dollars clipped from utility stock values

What goes up has a traditional sequence of returning to earth again. Some times it bounces a bit before coming to rest. That's one way to look at the market in utility stocks. The 1927-1929 swing carried utility common stocks up to an average of thirty-five times earnings, and then—well, fifteen months after the peak they sold for twelve times earnings, and no one is now sure just what's what. Where's the bottom, where's the bounce, where's good solid earth? One thing is certain, the buyers of stocks for some little time to come will be more interested in yields and current earnings than in prospects or prospectuses, even though the probabilities of reasonable prosperity and market interest would seem to make future values bright.

Again customer sales stole a march. The $135,000,000 raised in this way in 1930 was but 12 per cent less than in 1929, and the average sales for the past ten years were $190,000,000 a year. That's not bad, either. Shares per sale continue to fall, showing that the little fellow is absorbing his part.

It seems probable that today 10 per cent of the consumers of electric light and power have a financial interest in their local community. In the ten-year period 1921-1930 customers and employees supplied locally a fifth of the total investment in the entire power industry.

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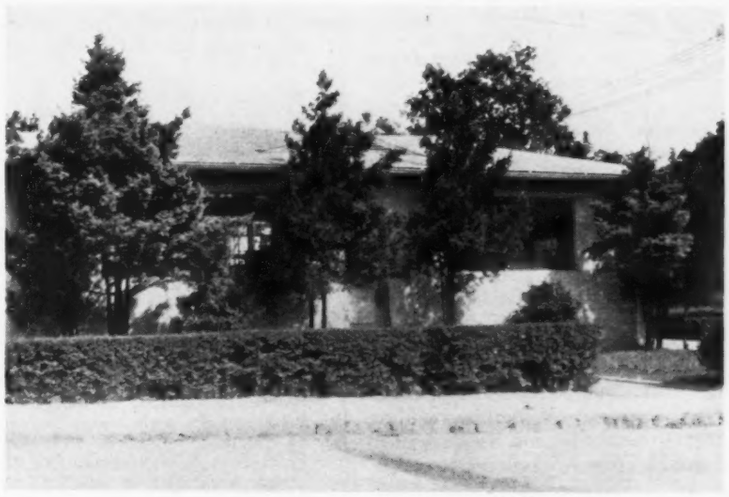
ATLANTA SUBSTATION—PEACHTREE ROAD STYLE



Two-tone finish of three Westinghouse 48-kva. induction feeder regulators at the Piedmont substation of the Georgia Power Company in Atlanta has resulted in an installation less than a half block from the fashionable Peachtree Road which so harmonizes with its surroundings that few passersby realize it is not a residence.

▼ ▼ ▼

Supreme Court Again Sustains South Carolina

DISMISSING THE CASE of the Broad River Power Company versus the State of South Carolina on December 15, the United States Supreme Court for the second time sustained the ruling of state courts prohibiting the company from abandoning its street-railway service in Columbia, S. C. In its previous decision the Supreme Court said that the case did not raise the question whether a public service company may be compelled to serve, even in a branch of its business, at a rate which is confiscatory and also that the case did not involve a determination of whether the rate is confiscatory. The company contended last month that since the losses from the operation of the railway service must be paid by the patrons of the power and light business, the question of rates was brought up in a petition for the abandonment of railway operations in the city involved.

▼

Five Million Horsepower Seen in St. John Region

A SCHEME FOR BRINGING the potential hydro-electric energy in the Lake St. John district of the Province of Quebec to more than 5,000,000 hp. by turning the waters of Lake Mistassini into Lake St. John, 150 miles south, is now being studied by provincial engineers. Digging a canal 3 miles long and 30 ft. deep is, promoters of the plan say, all that would be necessary to divert the waters.

Power Board Backdown on Staff Thought Unlikely

DESPITE MUCH PRESSURE brought to bear upon members of the new Federal Power Commission, there was no indication as the ELECTRICAL WORLD went to press that any one of the three former officials—Frank E. Bonner, the executive secretary; William V. King, the chief accountant, and Charles A. Russell, solicitor—whose contention has been so widely noticed will be reappointed. Immediately on taking office three members of the new commission, including Chairman George Otis Smith, advised these gentlemen that they were not to be reappointed. Chairman Smith explains that the three men were treated exactly alike. No one of the three was considered for even temporary reappointment because of the feeling that animosities had developed which made it desirable that the new commission conduct its work with new men in the three positions.

In a letter to Chairman Smith Mr. Bonner says:

"I quite agree with your understanding that the position of executive secretary which I have occupied under the cabinet-officer commission is automatically abolished by the law authorizing the new commission. The executive duties which I have carried for the most part are now transferred to the five full-time commissioners. As I advised Secretary Wilbur some time ago, and as I notified you on December 22, it has been my intention to relinquish my connection with the commission when the reorganization became effective. I have deferred submitting a written resignation only because of a willingness to render any assistance the new commissioners might desire in their difficult task of becoming acquainted with the highly technical problems involved in this activity. Through efforts made during the past year the docket has been practically cleared of pressing applications, and I think you will find the current work of the commission in a satisfactory condition."

Apparently there is nothing to justify published reports to the effect that the commission might reconsider its action and give one or more of the three former officials a temporary appointment. Indications also are that nothing more than speech making will result from the proposed reconsideration by the Senate of the vote by which Commissioners Smith, Garsaud and Draper, the members concerned, were confirmed, although emphatic denunciations of their action as it affected Russell and King have been made by a number of anti-utility senators who regarded the solicitor and the chief accountant as standing for the rights of the public as against alleged efforts by hydro-electric companies to misrepresent pre-license costs and circumvent the water-power law under which the commission functions.

▼

Wyman Hydro Station on the Line in Maine

THE NEW WYMAN HYDRO PLANT of the Central Maine Power Company at Bingham was placed in service on Monday of this week following a ten days' testing period. Three 34,000-hp. generating units will compose the completed installation, which will represent a twelve-million-dollar investment. The dam at this point is an earth-filled structure with concrete core, its length being 2,800 ft. and its height 150 ft. It impounds 2,000,000,000 cu.ft. of water in the upper 15 ft., and behind this lie the headwater lakes of the Kennebec River, with a natural storage of 32,000,000,000 cu.ft.

Brief History of the "Electrical World"

The *Electrical World* (published under that name since 1883 and tracing its history back to 1874) is a consolidation of the *Electrical Engineer* (founded in 1882 as the *Electrician*) and the *American Electrician* (founded in 1896). Final consolidation under the title of *Electrical World* took effect on January 1, 1906, the *Electrical World* and the *Electrical Engineer* having been acquired by the McGraw Publishing Company in 1899 and amalgamated as the *Electrical World and Engineer*, and the *American Electrician*, a McGraw monthly, having been absorbed seven years later.

The roster of past editors of the *Electrical World* includes Carl Hering, Louis Bell, W. D. Weaver, T. C. Martin and many other men prominent in the electrical industry—some, like those named, no longer living, and others, like W. H. Onken, Jr., C. O. Mailloux, A. S. McAllister, Frank F. Fowle, F. M. Feiker, D. H. Braymer and H. V. Bozell, still active in engineering and industrial service. L. W. W. Morrow is now editor. Allen M. Perry is managing editor. Other members of the present staff are: Earl Whitehorne, contributing editor; G. F. Wittig, statistical editor; H. M. Cameron and A. E. Knowlton, associate editors; F. C. Wells, news editor; E. R. Searles and E. M. Glennon, assistant editors; F. R. Innes, Western editor; H. S. Knowlton, New England editor; Walter C. Heston, Pacific Coast editor, and Paul Wooton, Washington correspondent.

Maine's first 110-kv. transmission line went into service Sunday, when a section 35 miles long from Gulf Island station to Copper's Mills was energized. A 70-mile, two-circuit, 110-kv. line has been built from the Wyman station to Bucksport, where the Maine Seaboard Paper Company will take one-third of the output of the new plant, and interconnection will also be made with the Portland district. In the near future 190 miles of 110-kv. line will serve the industrial heart of Maine.

▼

Electrical Expansion in Alberta Continues

THE CALGARY POWER COMPANY, which completed 460 miles of high-tension transmission line in 1930, giving it a total of 1,865 miles, and whose 70,000-hp. Bow River hydro plants now serve 148 communities in the Canadian province of Alberta, expects to spend more than $1,500,000 in extensions and new developments in 1931. Most of this will be spent in building lines to new districts and in surveying and making plans for a new development on the Athabaska River, about 20 miles north of Obed, which will eventually cost over $3,000,000. As the Calgary company is selling power to Edmonton over its new 175-mile, 132-kv. line for 0.55 cent a kilowatt-hour and paying in the neighborhood of 0.95 cent for power purchased from that city, it is the company's plan to proceed with the Athabaska development as rapidly as possible.

Edmonton will spend $450,000 to improve its municipal plant in 1931 and in a year or two will install a new 15,000-kw. generator.

The Canadian Utilities, Ltd., of Calgary has completed a total of 85 miles east of Edmonton on its Vegreville system and 35 miles on the Grande Prairie system, with plans for 1931 of 150 miles of extension and addition of new generating equipment in some of its power houses.

▼

New Vice-Presidents for General Electric

CHARLES E. WILSON and T. K. QUINN of the General Electric Company have been elected vice-presidents and H. H. Barnes has been elected a commercial vice-president in charge of the New York district. J. L. Buchanan will be president of the General Electric Supply Corporation, succeeding Charles E. Patterson, who also, with Cummings C. Chesney, retires as vice-president. Mr. Chesney has been elected an honorary vice-president of the company in recognition of more than forty years' service.

"PUBLIC SERVICE" FLASHES SEASON'S CHEER

Two thousand lamps in many colors, rated in all at 66 kw., and 20 floodlamps totaling 20 kw. more were used in this exceptionally brilliant illumination of the Terminal Building, Newark, one of 29 commercial buildings in New Jersey decorated by the Public Service Corporation.

▼ ▼ ▼

District Power Matters in Washington State

AT SHELTON, WASH., a petition under the new district power initiative measure has been entered. It is intended to organize Public Utility District No. 1 of Mason County. The petition bears the names of 75 residents of the Hood Canal district, including all the members of the Hood Canal Mutual Company, which already conducts a profitable light and power service, taking energy from the Cushman plant of the city of Tacoma. The action was taken to forestall any possible usurpation of the territory.

Motion to dismiss a suit in which Walter R. Rennecke attacked the constitutionality of the district power bill has been filed in a federal court at Seattle.

Adjustment of differences between irrigationists of the Okanogan Valley and the Washington Water Power Company, which led to agitation for a district power plant in that territory (ELECTRICAL WORLD, November 29, page 982), were effected recently at an informal meeting at Okanogan between representatives of the irrigationists, officials of the company and the state supervisor of public utilities. A written understanding was drawn up at the meeting which provides that for short periods before and after irrigation seasons rates will be prorated on the monthly schedule. Removal of Wright-demand meters and an interseasonal rate of 2 cents a kilowatt-hour were agreed upon, as were also the adoption of a return to a test-meter system, under which tests are run twice a month, and submission of rate adjustments for 1930 to the Public Service Commission.

▼

Counsel Join Issue in New Hampshire Case

ASSERTING THAT SPECIFICATIONS submitted by state counsel in the New Hampshire Public Service Commission's investigation of capitalization, management and control of the New Hampshire Gas & Electric Company and the Derry Electric Company, units of the Associated Gas & Electric System, "are based upon a fundamental misconception of the regulatory powers of the Public Service Commission," Robert W. Upton, of utility counsel, has filed with that body at Concord a general denial of charges contained in the state's declaration. (ELECTRICAL WORLD, December 13, page 1070.)

State Counsel Louis E. Wyman, in submitting his specifications after the hearings had been in progress for several sessions, said he felt that the Public Service Commission would be justified in finding that there had been an effort to avoid regulation, an effort to avoid a utility's full duty to give the best possible service at the lowest cost consistent with a reasonable return, violation of New Hampshire law, diversion of funds from the New Hampshire companies to the Associated Gas & Electric Company, and the stripping of management control from the directors of the New Hampshire companies.

Final arguments in the case are set for February 2.

▼

Chamber of Commerce Ideas on Power Win

OVERWHELMING MAJORITIES have been polled in favor of the fifteen recommendations on a national water-power policy submitted about seven weeks ago by the Chamber of Commerce of the United States to 1,600 member organizations. Under the rules for voting about 3,000 ballots were recorded on each proposition. The affirmative majorities ranged from 2,815½ to 63½ for the second recommendation — in favor of state rather than national control—down to 2,157 to 679 for the eighth recommendation, concerning joint state and national regulation of interstate transmission. The fifteen recommendations were printed in the ELECTRICAL WORLD for November 15 (page 897).

▼

Rate Matters Affecting Three California Utilities

ACTING UPON INSTRUCTION of the City Council of Fresno, Calif., the city attorney has filed with the California Railroad Commission a demand that the electric rates of the Pacific Gas & Electric Company now in effect in Fresno be reduced to correspond with the recent reduction in the Modesto district. In taking this action Fresno has aligned itself with Oakland. (ELECTRICAL WORLD, December 20, page 1115.)

Reductions in industrial and agricultural rates, effective May 1, have been announced by the Southern California Edison Company and approved by the commission. The reductions will aggregate $775,000 annually and will apply throughout the company system in southern and central California, affecting 15,484 agricultural consumers and 18,041 industrial consumers. President R. H. Ballard says that this is the company's third major voluntary reduction since 1927 and the eighth of a series of

voluntary reductions inaugurated in 1920.

The Southern California Edison has been authorized by the commission to file a revised rule governing electric line extensions which will result immediately in refunds being made by that company of more than $165,000 advanced by consumers for such extensions.

The commission has denied the petition of the Los Angeles Gas & Electric Corporation for a rehearing on the recent order reducing rates for natural-gas service by that company approximately $1,350,000 a year and making permanent temporary rates for electric service carrying a reduction of approximately $750,000. The new rates were to become effective January 1, but the company, which asserts that the gas tariff imposed by the commission is confiscatory, obtained a temporary restraining order in the federal courts as a step toward a preliminary injunction.

▼

San Diego Gets Share of Hoover Dam Power

NEGOTIATION OF CONTRACTS with the eleven municipalities which share the 6 per cent allocation of Hoover Dam power announced in March is proceeding in Los Angeles with the District Council of the Bureau of Reclamation. Secretary of the Interior Wilbur has announced that 90,000,000 kw.-hr. has been allocated to the city and county of San Diego. This energy is over and above the 4,240,000,000 kw.-hr. originally allocated and was made available by authorization of an increased water level. Los Angeles also applied for the additional power, but gave way to San Diego. By including San Diego in the allocation, Hoover Dam energy is now shared by three states, thirteen cities and the Metropolitan Water District of Southern California.

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Pennsylvania P. & L. Cuts Million Plus from Charges

A RATE REDUCTION to domestic customers which will amount to $1,125,000 or $1,500,000 annually was announced on December 24 by the Pennsylvania Power & Light Company. The company serves a wide territory in southeastern Pennsylvania, including Allentown, Bethlehem, Harrisburg, Wilkes-Barre and scores of smaller cities. The new schedule will also apply to the 27 minor companies in the same territory which the company has asked permission to buy, if the Public Service Commission approves the purchase. Details of the cut were not given.

MONARCH OF MONARCHS

—R. I. Nesmith

The new Empire State Building in New York, highest in the city and the world, fast nearing completion, was lighted up for the first time at Christmas.

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Rate Dispute Arises in Montreal and Quebec

MAYOR CAMILLIEN HOUDE of Montreal, who is also leader of the Conservative opposition in the Provincial Legislature of Quebec, precipitated a controversy over electric rates when, addressing the Legislature on December 9, he urged the creation of a commission of experts who would delve into the affairs of the electric light companies, revise their capital by cutting out what he termed to be "watered stock," and then fix electric rates on what it decided was the true capital value of the companies. He claimed that rates for electricity in Quebec were much higher than in Toronto.

This criticism drew a reply from Sir Herbert Holt, president of the Montreal Light, Heat & Power Consolidated, who maintained that the net cost to Montreal citizens of electricity for tramways, aqueduct and street lighting is $1.80 per capita against $3.57 per capita in Toronto, where public ownership prevails, and that on deducting taxes paid by the utilities the net cost in Montreal is only 43 cents per capita.

A plea for public ownership of power plants is contained in a report just issued by a special committee named in May, 1930, by the Quebec City Council to investigate electricity rates in the city and district. The report finds fault with the Quebec Power Company and holds that rates charged by the company for electricity are excessive, and in order to prove this contention it presents a long survey of tariffs in other parts of Canada, especially Ontario.

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St. Lawrence Plank of Ontario Liberals Bold

COMPLETE INDORSATION of the St. Lawrence River canalization and power scheme as a joint international venture between Canada and the United States, as briefly related already, and condemnation of the provincial policy of purchasing power from the Province of Quebec were features of resolutions adopted at a convention of the Ontario Liberal party in Toronto on December 16. By an overwhelmingly large majority the convention declared:

> Resolved, that this convention disapproves of and condemns the policy of the Conservative party in purchasing high-priced power from companies outside the province; that this convention goes on record against the exportation of Canadian power to foreign countries; that the policy of obstruction by the provincial government of Ontario of the development of the St. Lawrence River for navigation and power be stopped; that the Ontario government not only cease opposition to the federal government, but urge the federal government to conclude a treaty with the United States as a result of which deep navigation and the development of cheap power on the St. Lawrence will be provided; that Ontario agree to construct power houses on the Ontario side of the St. Lawrence River and to pay to the federal government a rental for the head of water created by the navigation works sufficient to bring about the construction of those works.

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Radical Utility Bills Looked for at Albany

PUBLIC UTILITY LEGISLATION at Albany promises to be of unusual interest during the coming annual session of the New York State Legislature. Republican leaders are said to be inclined to accept at its face value the 750,000 plurality received by Governor Roosevelt as a mandate of the people to support his policies, and if such conclusion is reflected in the attitude of the Legislature, a number of radical departures in the manner and method of

public utility regulation may gain statutory authority.

The Democratic program of last year in the way of public service law amendments is being carefully revamped with the idea of improving the language of the bills. It is believed that the Governor will urge the passage of a law creating public utility districts, under the provisions of which a municipality or a group of municipalities could by petition and vote create a district which would issue its bonds and go into the utility business. For instance, the cities of Troy, Albany, Rensselaer, Schenectady, Watervliet and the intervening territory might decide, if the utility district law were passed, to set up a district and go into the gas and electric business in competition with existing private corporations.

There is, however, a serious economic obstacle to this plan, and that is the average amount of indebtedness of municipalities throughout the state. While a utility district so created would issue its own bonds, which would be backed by the realty in the territory composing it, the district would at all times remain a part of a municipality, and to permit a utility district to issue bonds when the municipality of which it is a part has already nearly reached the constitutional debt limit would be poor economics. The bill introduced last year did not take this feature into consideration; neither did it make provision for setting up proper depreciation reserves and for uniform methods of accounting to be employed by public utility districts. This in itself is an essential feature.

Early in 1931 the St. Lawrence River Power Commission will make its report and will no doubt accompany it with proposed legislation. It is expected that whatever recommendations are made by this commission, within the bounds of reason, will receive favorable consideration by the Republican majority.

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Bill in Bay State to Restrict Utility Mergers

A BILL TO PROHIBIT the future consolidation or merger of gas or electric operating or holding companies unless special authorization has been obtained from the Legislature has been filed in Massachusetts by Representative Leo M. Birmingham of Brighton. He also filed a bill to permit a community to take steps toward the establishment or acquisition of a plant, after having voted for municipal operation, if it fails within 150 days to agree with the local company upon terms for the purchase of such company.

Representative Arnold Leonard of Watertown has filed, on petition, a bill giving to the Department of Public Utilities supervision of associations and trusts which sell gas or electricity to gas and electric companies under common ownership.

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Alabama Legislators Talk of Ban on Power Export

SOME MAJOR ISSUES to face the quadrennial session of the Alabama Legislature which opens in January will concern electric rates and transportation of hydro-electric power outside of the state limits. Some of the legislators are said to be listening with an attentive ear to an aggressive campaign led by the Thompson chain of newspapers either to prohibit entirely the exportation of power outside the limits of the state or to impose a heavy tax on all power that leaves the state. Another element in the Legislature holds that this campaign of "backbiting" the corporations can only have harmful consequences and strongly opposes the enactment in Alabama of anything like the Maine law relating to power exportation.

Among those who contend that the corporations are not paying their share of taxes is Attorney-General Charles C. McCall, who has instituted a suit against the Alabama Power Company seeking to recover $236,822, or two-fifths of a mill per kilowatt-hour on all electricity exported out of the state for the year ended October 1, 1930. The power company, it is said, paid a privilege tax only on energy consumed within the state. A suit has also been filed against the General Waterworks & Electric Corporation seeking to collect a franchise tax of $2 for each $1,000 invested in the state.

Utility interests will closely watch the action of the Legislature as it will largely determine the policy of the state in handling taxation and rate matters during the next four years.

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Coming Meetings

Empire State Gas and Electric Association—Electric conference, Briarcliff Manor, N. Y., Jan. 15 and 16. C. H. B. Chapin, Grand Central Terminal, New York.

American Engineering Council — Annual meeting, Washington, D. C., Jan. 15-17. L. W. Wallace, 26 Jackson Place, Washington.

National Electrical Manufacturers' Association — Midwinter meeting, New York headquarters, Jan. 19-23. A. W. Berresford, 420 Lexington Ave., New York.

American Institute of Electrical Engineers — Winter convention, New York, Jan. 26-30; district meeting, Pittsburgh, March 9-13. F. L. Hutchinson, 33 W. 39th St., New York.

North Central Division, N.E.L.A.—Commercial meeting, Nicollet Hotel, Minneapolis, Jan. 26 and 27; engineering meeting, Minneapolis, Feb. 23 and 24. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Pacific Coast Electrical Association—Commercial Section, Los Angeles, Feb. 5-6. S. H. Taylor, 447 Sutter St., San Francisco.

Midwest Power Engineering Conference—Chicago, Feb. 10-13. G. E. Pfisterer, 308 W. Washington St., Chicago.

Oklahoma Utilities Association—Oklahoma City, March 10-12. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

Illinois State Electric Association — Springfield, Ill., March 12 and 13. G. W. Schwaner, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

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Oregon Legislature Will Have Difficult Task

WHEN THE OREGON LEGISLATURE assembles in this month one of the first duties it will have to perform will be the writing of an enabling act or acts containing provisions to lend authority and instruction to one or more counties of the state for the organization of water and power utilities districts, as provided by the constitutional amendment approved by the electorate last November.

An important and difficult problem for the Legislature to solve concerns the formation of water and power districts the extension of which may incorporate territory containing municipalities already owning and operating utilities of one or both classes. Should there be no provision made for the protection of these utility-owning cities and towns, the water and power districts amendment may operate to require such municipal governments either to relinquish their properties or to bear the burden of double taxation in the form of assessment for the maintenance of their own systems and similar levy for the operation of the utilities established under the district amendment.

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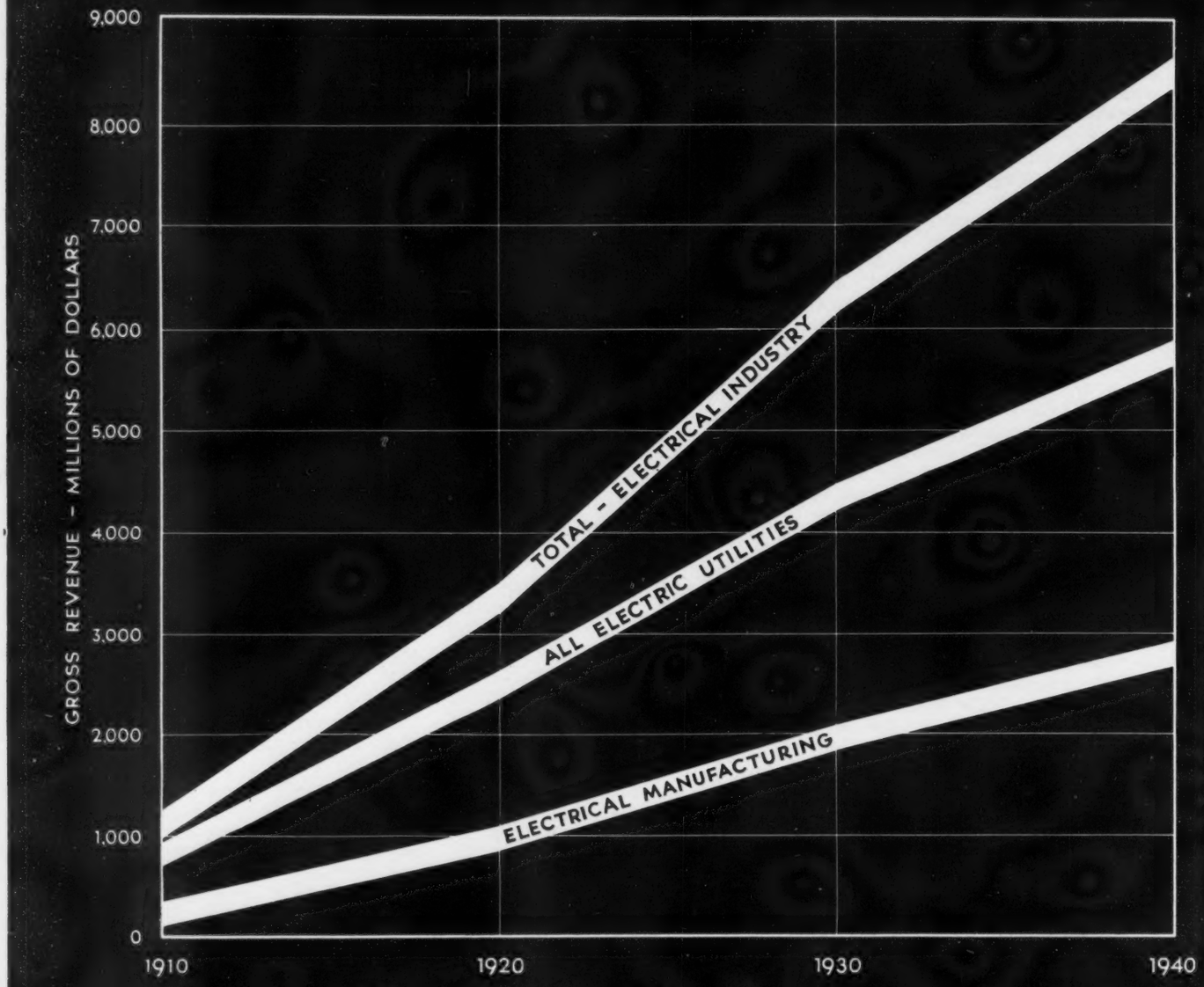
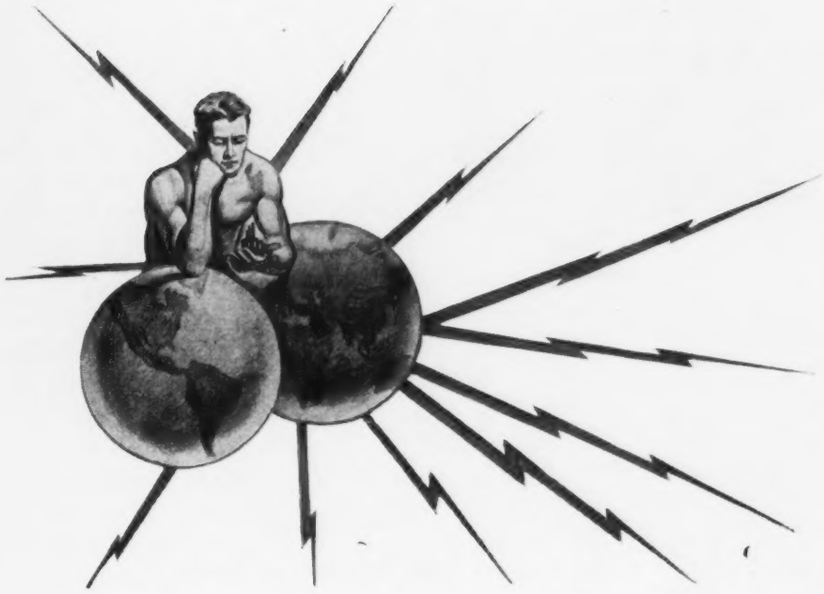
Utility Commission for Texas Again Sought

A LEGISLATIVE BUREAU will be maintained at Austin by the League of Texas Municipalities during the session of the Texas Legislature which will begin January 13. The purpose of the bureau will be to furnish members of the Legislature with data looking to the enactment of a law creating a state public utility commission. In previous legislatures this proposal has met defeat. Thirty-six cities are members of the league, including Amarillo, Austin, Beaumont, Dallas, El Paso, Fort Worth, Galveston, Houston, Port Arthur, San Antonio, Waco and Wichita Falls.



Three Decades of Trends and Prospects Foretell Continued Growth

1910—1920	1920—1930	1930—1940
Direct lighting	Indirect lighting	Built-in lighting
Mazda lamps	Gas-filled Mazda lamps	Neon-type lamps for general use
Wireless communication	Radio broadcasting	Television-radio broadcasting
Railroad electrification (d.c.)	Railroad electrification (a.c.)	Railroad electrification (d.c. high voltage)
Street lighting	Ornamental street lighting	Full-highway lighting
Electric signs	Neon sign lighting	Architectural advertising
Light-duty appliances Flatirons Vacuum cleaners Fans Toasters	Heavy-duty appliances Refrigerators Ranges Washing machines Oil burners	The electric home Air conditioning Off-peak storage house heating Hot water heating Home talkies
Electrification of industry Motorization Heat treating Electrochemistry Welding	Modernization of industry Electrified mass production Electric furnaces and ovens Electrodeposition of metals (large scale) Fabrication by electric welding	New era in industry Photo-cell, vacuum tube production lines Electric heat for all processes Electrodeposition of non-metals Welded machines and buildings
	Floodlighting	D.c. transmission
	Rural service	Electric-steam service by utilities
	Incandescent projection lamps for movies	Two-fluid thermal cycle
Long-distance telephony	Machine telephone switching	Television telephony



I would not dare to say what I think electricity may do in the future. We are always making the mistake of supposing we have exhausted our knowledge in any direction. Discoveries and inventions are not terminals. They are fresh starting points from which we can soar to new knowledge.

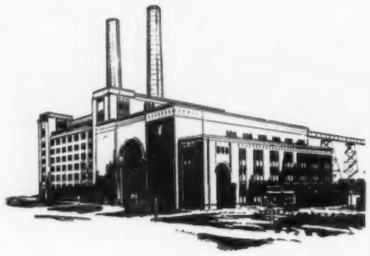
—Dr. W. R. WHITNEY.

SURVEYS and PREDICTIONS

SOME think electricity to have reached its peak in use; that the electrical age is here. They forget that only one home in three uses electrical appliances; that only two out of three homes are wired for electricity, and these inadequately; that only 2 per cent of the railroad mileage is electrified; that industry is not motorized completely and has done relatively little with electric heating; that there are more than twenty thousand different electric appliances manufactured for household use and only comparatively few are used; that air-conditioning for homes and offices is all but unknown; that highway lighting to avoid accidents is not the practice; that the age of air which is now here will call for an enormous electrical development; that the photo cell, the vacuum tube, the gas lamp call up visions of practical applications capable of developing into large business enterprises; that health apparatus is in the embryonic stage—all these things and more are on the horizon and ready for use if the public demands them or the industry can develop the demands.

Since 1914 the cost of living has gone up 70 per cent and the cost of electricity has gone down 25 per cent. When the homes and farms are electrified, the railroads electrified, the highways lighted and homes and industries are using the devices available to them, then electricity will be so universal and so inexpensive that there will be no excuse for not using it.

Aside from basic political and economic factors that are common to all industry, the next decade in the electrical industry will be commercial in large measure. With electricity as the binding cord, the manufacturers, the utilities and the supply groups have a common interest in building a greater use of electricity and electrical equipment.



They must sell the electrical idea individually and collectively to the public. They must so organize into units and into teams that their business in the consumer market will compete successfully with other businesses. They must encourage new ideas, inventions and developments so that their services and facilities can be multiplied. There is every reason to believe that the enviable record of each branch of the industry in the past can be maintained and exceeded by marshaling intelligently the individual and co-operative talents of the industry in the common cause of selling electricity and electrical devices.

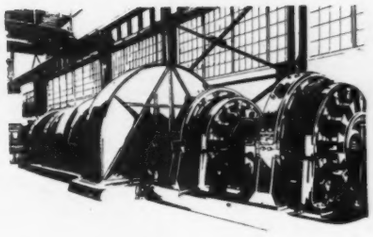
STATISTICAL data are available on past accomplishments of the electrical industry. The record is astonishing in magnitude and in rate of growth. Capital investment in the industry was $5,740,000,000 in 1910, $12,650,000,000 in 1920 and $23,590,000,000 in 1930. In 1910 the revenue or income figures were $1,025,000,000, in 1920 more than $3,370,000,000 and in 1930 more than $6,240,000,000. In the first decade named the figures more than doubled, and in the second they almost doubled. In 1940 the indicated investment figures are $32,000,000,000 and indicated annual revenue is $8,570,000,000.

Billions of dollars are beyond human comprehension and the growth of the electrical industry is measured better by simply observing the present degree of electrification in this country. In light, heat, power, transportation, communication, entertainment and other basic elements of life the use of electricity and electrical equipment takes a tangible and indispensable form in everyday life and business. Even though the markets are only touched, the evidence is available to show that the electrical industry is a necessary support for modern civilization. And it should not be forgotten that private initiative and enterprise have made these records possible. The structure was built by the men and women of the electrical industry.

During the past year general business has suffered from one of the depression periods that occur at intervals. This resulted in a yearly increase below normal in the electrical industry, if 1929 be considered normal, and has had a very strong psychological effect on the attitude of the country toward business. Pessimism and pressure for economies replaced the normal optimistic and daring attitude of the American business man. There is no reason for this attitude in this country. This is true especially in the electrical industry, for at no period in the past did there exist so many embryonic developments in electrical devices or so many opportunities to expand the business of well-established branches. All groups in the industry came through the present depression with available surplus funds, good credit and unimpaired man power.

BACK in 1920 there was the beginning of a business depression. Men, even in the electrical industry, talked of saturation, of a slow growth in the future, of size as an indication of growth limitation and preached the gospel of fear and famine. They took no account of past history or of the inventive skill that has proved so prolific in developing new electrical business. How mistaken they were! Radio broadcasting came over the commercial horizon, power business nearly doubled, the domestic appliance business grew rapidly, electric furnaces and electric heat became tools of industry, branches of other industries, such as the automotive, expanded enormously in their use of electrical products, the gas-filled lamp came into being, and new conceptions for quantity use of electricity penetrated the national consciousness. The result was a decade of marvelous growth—growth far beyond the imagination of even the more vividly enthusiastic contemporary students of this yet-infant industry.

And in 1931 even better conditions prevail. Saturation in power, light and heat is not at

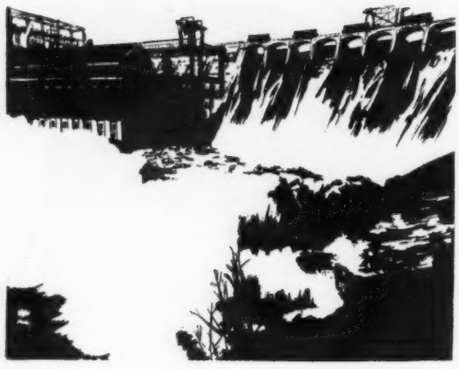


hand. New developments in equipment and processes are more numerous than ever before. Electricity is more widely accepted as the universal and economical tool for business and pleasure. Who can say the highways of the country will not be lighted in the next decade? What influence is the new electron tube going to have on power and industrial equipment? What will be the future of the new and efficient electrically activated gas lamp? Why cannot air-conditioning be visualized as a common asset to homes and business buildings? What will the mercury turbine, oil-less breaker, direct-current tubes and rectifiers, photo cell and many other perfected laboratory devices come to mean in commercial applications? What will the new principles such as the network, automatic, supervisory and other conceptions do toward changing present assembly practices and equipment designs? Surely there are more new things, more ways to reduce costs and more ways to capitalize upon existing markets effectively than ever existed in the previous history of the electrical industry. Facts available, a logical analysis of market possibilities and a full measurement of modifying and amplifying factors —all lead to the conclusion that the next decade offers business prospects fully equal to those of the past and bright with the unknown elements.

HOW is the available business of the next decade to be obtained? Nothing can take the place of the initiative and enterprise of individual men and companies that have built business in the past; these are still needed in greater degree than before. But, in addition, there is every reason to believe that co-operative efforts between industry groups can be made effective and useful. The industry as a whole should sell the electrical idea to prospective buyers. Highway lighting, railroad electrification, household refrigeration and air conditioning, electric heat in industry, motorization of industry, modernization of production, decorative and architectural lighting—all these and many more electrical use ideas should be advocated in tangible ways by the industry as a unit, as well as by separate industry groups. The electrical industry is in competition with other industries in the buyer markets; it must work for its own business salvation.

BUT more is required than a united front in public education and sales promotion. Consistent work should be done to develop constructive legislation in the form of uniform laws and ordinances that encourage full use of electricity safely at a minimum cost. Very hard and intelligent work should be devoted to developing a selling organization that will solve the problem of distribution by getting a large sales volume economically. There is need to develop better trade practices, and much can be done to study markets and to organize to supply the markets according to well-planned programs. In addition, the way should be made evident for the development and acceptance of new equipment and methods so that they may be adopted easily and readily. There is a long list of definite things that a united industry counselor staff could attack to the benefit of the industry and of each separate branch of the industry. Future programs will doubtless provide for the establishment of such a body.

All branches of the industry must now be considered national, and even international, in scope of operations. The manufacturers, communication interests and light and power interests operate in all parts of this country and are more or less intimately concerned with developments in other countries. International legislation, laws, tariffs, finance, trade rules and business practices must be changed or modernized to meet the needs of a commercial international development of the electrical business under the leadership of this country. To a more intimate degree the national situation must be considered. During the next



decade this country will develop a public attitude, supported by legislation, toward each branch of the electrical industry. This move should be welcomed as a stabilizing influence in industry growth, but the industry should see to it that it receives a standing in national affairs such that it can go forward under the pressure of free play of private enterprise and initiative. It will get what it earns if the public is made acquainted with its actions and its business and service philosophy.

DURING the period of formation of a national and international policy with respect to the industry it should be evident that self-discipline should be practiced on its own past. Acts of any company or group are reflected in a public sentiment that acts upon all the companies or groups. In some way each group and the industry as a whole should develop from within principles and practices whereby constructive public relations and educational work will be done. Such a policy will help the industry to develop a national policy and practice of its own, which it can advocate as being in the public interest and possibly have adopted as a national policy to be exerted from without.

By reason of the size and complexity of the industry and its relations to national life there are many very difficult policy and business problems to be solved in the next decade. It is doubtful if any one individual has the capacity to solve any of these problems, and there is no doubt that proper solutions cannot be applied to practice through individual efforts only. As never before, group work must replace individual work in the coming period of stabilization and expansion. It is beyond individual human capacity to grasp all the elements and reach an intelligent conclusion that can be made operative. The generals of the industry must formulate programs whereby the staffs can work intelligently and effectively to a real purpose.

How much the industry prospers in the next decade will be determined by how effectively it develops its team play in each branch and as a whole. In the 1910-1920 decade each company grew as a local enterprise of small magnitude and under one-man control. This was effective for the conditions and the period. In the next decade the local units or companies were consolidated with larger units with executive and financial staff control. Each consolidation was developed as an individual case and was made for expedient reasons. Each organization developed upon the same independent basis of self-sufficiency.

THERE was little system or interrelation between units or branches of the industry. This period is about over, and the next decade calls for what might be called industry stabilization, whereby each branch and the industry as a whole shall work out its organization and operations according to a planned program developed from a national and long-time perspective.

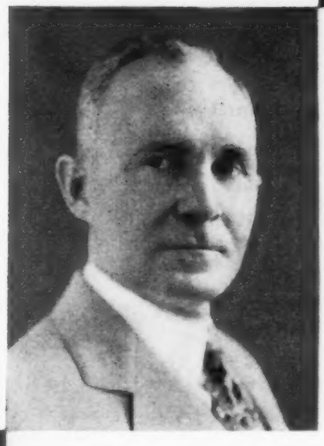
To do this there must be team play in the units of any branch and in the branches as a group. Thus the major problem is for the industry and each branch to recognize the new status and then organize to meet the changed conditions effectively and intelligently. This is the major problem that faces the electrical industry as it looks hopefully toward 1940.

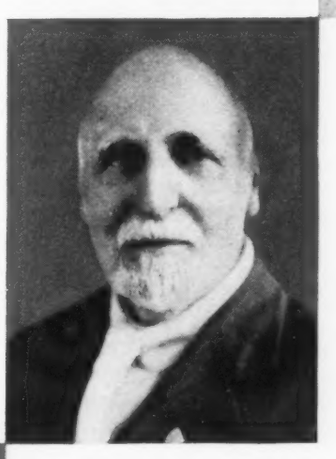
UTILITY LEADERS LOOK AHEAD

C. L. Edgar

Discuss rates, public relations, ways to increase business, finance and costs. Encouraging outlook on all problems. Domestic business the great opportunity

J. F. Owens





Alex Dow

M. S. Sloan

MANY aspects of the light and power business are worthy of executive comment, but a few were chosen by ELECTRICAL WORLD for special consideration by representative utility executives. The answers are necessarily more or less categorical, but they indicate the direction of executive thought and action. The particular points cited for discussion were:

1. Has the domestic business had a minimizing effect on the business depression? How can it be developed more rapidly and economically?

2. Investments are said to be increasing faster than revenues. Do you believe this trend can be changed or that market development will change it?

3. Do you believe a minimum, fixed or capital charge with low energy rates can or should be adopted generally? Can the validity of the capital or service charge be made evident to customers through educational efforts?

4. Do you believe a national public relations program is advisable, and what should it be?

Answers to these broad questions are brief, but

they show a considerable agreement and point toward constructive industry effort.

1. Comments on domestic business

Our domestic business has been touched, like every other branch of our business, by the feeling that times are hard. There has, nevertheless, been in our experience an increase in the average use per household, presumably attributable in large part to installations of refrigerators and ranges. To some extent this has been canceled by the number of households which are not using any electric energy, the householders having doubled up with friends or relatives or having moved away. There remains a net gain of 8 per cent in this class of service, as a class. In an industrial city, however, the reduction in sales of industrial power is a controlling factor in comparisons of earnings even where, as in our case, every residence is served. The possibilities of increase in domestic business are respectable, but not in such a case a large factor. Good service at a promotional rate is the best agent for development. —ALEX DOW, *president Detroit Edison Company.*

T. O. Kennedy

While the number of domestic customers on the lines of our company is slightly smaller than one year ago, the average use per customer shows a considerable increase, being 624 kw.-hr., per customer as compared with 561 for the year ended November, 1929.

For rapid and economical development of domestic business, we suggest the adoption of a promotional type of rate and the sale of appliances, especially improved lighting equipment, ranges, refrigerators and radios, both directly and through co-operative effort with other dealer outlets. The sale of additional and adequate wiring is also necessary.—T. O. KENNEDY, *vice-president Ohio Public Service Company.*

Considerable attention has been given the development of domestic business in the territories served by the Standard Gas & Electric Company and its subsidiary and affiliated companies and substantial increases have resulted during 1930.

Intensive studies have been made on this subject during the past few years and during the same period educational and sales campaigns have been conducted successfully in building up load from a domestic standpoint. During the past year, when certain sources of industrial power business have not reached the volume of preceding years, the domestic load has been an important factor in minimizing the effect which otherwise would have felt more keenly as a result of the slackening in the industrial business.

We believe there is still considerable room for the further development of this business, and until such time as inventive genius falters and manufacturers cease the production of electrically powered labor-saving devices for use in the home and on the farm there is presented to the electrical industry a constantly growing field for obtaining added load from these sources. The means now being employed for the development of increased revenue from domestic use of power must be broadened proportionately with the growth of territories served by utility companies, and intensive sales efforts supported with advertising and educational campaigns will do much in meeting the problems that this phase of our business presents.—JOHN T. O'BRIEN, *president Standard Gas & Electric Company.*

I believe that the domestic electric light and power business is far from being fully developed. As to what can be done for its more rapid and economical development, that depends in a very great measure on local conditions. No general rule can apply. Nothing will take the place of personal contact and promotional work. Sales must be made by competent men, thoroughly informed not only on the electrical equipment but on company policies and rates. Sales must be followed up with service. Careful surveys and systematic study are important. — J. F. OWENS, *vice-president Oklahoma Gas & Electric Company.*

While the public utilities are, like the rest of industry, feeling the depression, the data which I have been able to collect seem to show that the letting down of business is much less in our companies than in any other line of industry. This is probably due to the great diversity of uses to which our product is put. If our business was confined, as in many other lines, to strictly industrial activities, the story would be quite a different one; but a large part of our output is used in stores and offices and in residence lighting and electric appliances in the home. The growth of store and office use has been somewhat retarded, but the use of electricity in the home has been very little curtailed during the general industrial depression. The results of these combined activities show that while our industry for the whole of the United States is running somewhat less than for the corresponding period a year ago, the amount in any one week during the year has not exceeded 5 per cent, and in many cases has been as low as 2 or 3 per cent. I think that 4 per cent would be a fair average.

New England seems to be doing somewhat better than the rest of the country—that is, the drop is not quite so large, and seems to be only 2 per cent, instead of 4 per cent for the rest of the country. This is quite largely due to the fact that New England is, relatively speaking, more a district of homes than the remainder of the United States. The result of all this is that the public utility people are in a much better frame of mind than the average manufacturer. While no one, of course, can foresee what the immediate future will bring forth, we are convinced that New England in general, and our business in particular, will in due course recover its old-time vigor, and that we may expect in the future, as in the past, a growth in our business year by year of something in the neighborhood of 10 per cent.

Our opinions on this general subject seem to be borne out by our actions. It is almost a year ago that some of us were called to Washington to advise the President as

to the probable budget for the year 1930. I reported for the New England utilities an expenditure of $60,000,000. Now that the greater part of 1930 is behind us, we have revised these figures and find that the $60,000,000 has increased to $85,000,000, as is shown in the figures presented in the report of the Council. I have not made any detailed attempt to get the budget for 1931, as I realized that under present conditions many of the proposed activities are still in abeyance. I have, however, obtained from most of the large public utilities in New England an opinion as to their expenditures for 1931. We must bear in mind that the $85,000,000 in 1930 had in it two very large activities which will not be duplicated in 1931. They were the dam and power house at the Fifteen-Mile Falls on the Connecticut River and the dam and power house at Bingham on the Kennebec. The amount spent in 1930 on these two projects will approach $25,000,000, so that the normal and comparable figure for 1930 would be $60,000,000 instead of $85,000,000. Assuming that the smaller companies in New England are going to make expenditures in the same general proportion as those companies whose data I have obtained, I assume that the expenditures for 1931 for the entire electric light and power industry in New England will approximate $65,000,000.—CHARLES L. EDGAR, *president Edison Electric Illuminating Company of Boston.*

Analysis of the statistics of electric utilities the country over for the last year emphasizes anew the importance of residential sales. In the face of pronounced falling off of large power sales, increased sales to homes (even at decreased rates) have prevented grief over decreased gross revenues.

While sales to homes are increasing, on the average, we still have a long way to go before reaching anything like complete electrification of the home. I believe, however, our path is well charted, with major landmarks:

1. General adoption of promotional rate structures, with fixed customer charge and a low energy charge.
2. Aggressive and persistent educational work and advertising directed to homemakers.
3. Intelligent advertising, promotion and selling of electricity—using home equipment, notably refrigerators and, where conditions warrant, ranges and water heaters.

Another obstacle to complete home electrification is the initial investment required for equipment. This is being overcome by long-term, easy-payment plans for the purchase of these appliances. A cut in manufacturers' prices, reflected in the utilities' prices, immediately produces larger and easier sales.

J. J. O'Brien

Skillful advertising and salesmanship are also powerful aids to intensive merchandising as a means of putting a large volume of electrical equipment into homes by emphasizing the merits of the articles as time- and labor-saving devices. The companies of the New York Edison System in the past two years have sold a large volume of electrical home equipment, particularly, during the past year, electric refrigerators to the amount of several million dollars. This has been accomplished under a form of rates distinctly not promotional. Intensive advertising and merchandising have undoubtedly had a constructive and beneficial effect on the sale of current in this system of companies and have done a great deal to keep up our load against a falling off in commercial and industrial uses.

Educational activities on new uses of electricity in housekeeping and on practical and economical ways to use electrical equipment, carried on by home economics bureaus which employ trained women lecturers to give talks and make demonstrations both in classes and to individuals at the company salesrooms or in homes, will promote home use of current. Lighting bureaus which employ the services of illuminating engineers to help customers solve their problems for obtaining more and better illumination are another means of acquainting the public with the need for increased use of electricity.

Since these services are considered by the utility company to be part of its duty in forwarding the most efficient, economical and complete use of electricity and of increasing use of service they can be given to the consumer without cost.—M. S. SLOAN, *president New York Edison Company.*

2. Reduction in system investment

The whole tendency is toward increase of investment in proportion to revenue. In many respects, such as the increasing demands for placing of lines underground, and for more costly construction under the guise of safety provisions, this tendency is not under our control. The present price of copper is the only evident factor tending to lower costs.—ALEX DOW.

There is perhaps a slight chance for investment to decrease in proportion to revenue, but the answer to keeping the proportion in balance is in more intense market development.—J. F. OWENS.

I do not believe that there is anything in the idea of cutting down capital expenditures. Of course, in theory it is perfectly possible to build half of a generating station for economy and the other half for capacity, the former, of course, costing 50 per cent more than the latter, the economic plant to be operated as many hours a day as possible and the capacity plant to be operated only during the peak. It is a beautiful theory, but I have not found any one who has carried it to its ultimate conclusion. It seems to me that the solution is to get the better load factor by a diversified business, and it seems to me that this is all that we can do.—CHARLES L. EDGAR.

The increase in investment per dollar of revenue is the result of many factors, notably reduced rates, improved standards of service and higher unit costs of labor and material entering into electrical construction.

We do not believe any appreciable opportunity exists for investment decrease, but with more intensive market development the ratio of investment to revenue should be reduced.—T. O. KENNEDY.

While there has been some discussion generally concerning rising investments in proportion to revenue, it must be remembered that the industry has been moving forward from a construction and equipment standpoint each year in its efforts to keep abreast of population and industrial growth generally which has progressed so rapidly.

It is a difficult matter for earnings to show continued marked increases in view of construction expenditures that have been necessary. However, these developments are the result of demands for additional service, and while such investments do not pay for themselves in the first year of operation, past performance, combined with indications for continued industrial growth, will certainly justify the facilities which have been placed in service recently and which are now in process of construction.—JOHN J. O'BRIEN.

3. Capital charge and rates

We have, after very serious consideration, adopted the area rate here in Boston. It is practically the same as the room rate and differs from the service charge fundamentally. While I have no criticism to make of the service charge, we had an idea that the feeling against it here in Massachusetts would make it rather hard for us to put it into effect in its proper form. We have been entirely satisfied with the effect of the room rate. Our list price is 7½ cents, and my own bill, for example, in the month of November came down to less than 4 cents, although I have no electric range, and my son's bill, which includes a range, came down to only 3½ cents. I think this type of rate is the solution of our rate problem.—CHARLES L. EDGAR.

I not only believe in a high first block energy charge or alternatively a fixed charge based upon demand, to be followed by a low energy rate, but I have been able to use such rates for many years and expect to continue using them.—ALEX DOW.

Average consumption per domestic customer has increased from 502 to about 540 kw.-hr. during the year, but less than half of the domestic customers use that much electric current. Domestic customers the country over are divided about equally into two groups—one group which uses 360 kw.-hr. or less a year and another group which consumes up to 1,200 kw.-hr. or more a year. In the first group are customers who on a flat rate, or even on some forms of minimum bill rate, will not pay their way. The fixed customer charge will cure this, or at least come near it, and will permit energy rates to be offered which on theory and on experience are promotional.

I know all the objections which can be raised—I think I've heard all of them—but I believe the justice and the merits of the fixed customer charge rate structure can be proved to any regulative body or general group of customers. The only customers who won't admit its justice and merits are those whose habits of living or purses preclude a widening use of current. And those who just can't afford more, at any price, are fortunately a small number.—M. S. SLOAN.

There is no question in my mind but that a rate which includes a fixed or capital charge with low energy rates should be ultimately adopted. It is, however, a very difficult thing to sell to the average customer. My own belief is that such a rate should be first offered as an optional rate, so framed as to be somewhat under the regular standard rate. This method will give an opportunity to explain the rate to individual customers and to sell them on its merit. It cannot be sold by advertising, and it will not be safe to adopt this rate as a general rate schedule until a considerable proportion of the customers have been sold individually on its merits.—J. F. OWENS.

Our company has had in universal use since 1922 a two-part rate with a service charge based on the meter size. Approximately seventy thousand domestic customers are now served under this rate. We believe that rates of this type can and should be adopted generally and that the public can be convinced that such a rate is not only equitable but that it best serves the interests of the customer in making possible the maximum use of electricity in the home at the lowest possible cost.—T. O. KENNEDY.

From a rate standpoint I believe there should be established a fixed service charge with comparatively low energy rates and that these should be adopted generally, and that electric and gas utilities should move forward materially in the quantity of service rendered the public, together with increased gross and net earnings derived therefrom.—JOHN J. O'BRIEN.

4. Public relations plans

The only way to neutralize the shouting about "power trust"—much of which is in bad faith—is to deny through the advertising pages of the newspapers any charge which permits of direct denial. Some of the Nebraska Power Company's work of this sort has been exemplary. The worst offenders against decency and truth are so evasive or are so privileged that opportunities for public denials are scarce. Unfortunately, denials are not "news," whereas sensational charges are "news," wherefore the use of advertising pages is necessary.—ALEX DOW.

Personally, I do not believe that people are very much influenced by the cry of "power trust." It is a catchword for the politicians and for the yellow newspapers, but we do not find that it has any weight in a community like ours, where the thinking people seem to be in the majority.

Generally speaking, it seems to me that our future lies in a more diversified business, which consequently means lower rates and a comprehensive service.

I saw an advertisement yesterday in one of the Boston papers in which it was distinctly stated that such and such an article was being sold at a very low price because the seller took no responsibility whatever for keeping the apparatus in running order, and that service would have to be furnished entirely by the buyer. In the past many of our companies have been operated on this theory. The development of a public relations department in the various companies has resulted in the overthrow of this theory, and I think that we are all now working with the slogan "Service first and always."—CHARLES L. EDGAR.

My own experience is that any difficulties we are having are very largely due to the activities of national

organizations. There is a distinct misunderstanding of the function and value of holding companies. There is a feeling that the local company is all right, but that an undue proportion of the customer's payment for electric service goes to some obscure and intangible, far-off organization. I believe that a carefully planned national advertising campaign, advertisements to be inserted in reputable magazines and publications setting forth facts, would be most effective. It cannot, however, be done in a half-way manner, and it should be continuous, not sporadic.—J. F. OWENS.

In their local situations utility executives are generally able to develop a favorable public attitude, so that aspirants to elective office are convinced they cannot score a political touchdown by using the utility as a football. It should be possible to attack the national problem effectively.

Perhaps a study and report on utility economics by a group of outstanding economists without the industry would be accepted by the national political parties as proof that there are many other matters of infinitely greater importance to the welfare of the nation than the cost of electricity, which is such a very small item in the family budget and a negligible percentage of the cost of manufactured products.

Aggressive efforts should be made to emphasize, as a factor in determining electric rates, the *value* of the service rather than its *cost*.

Since the attempt to nationalize the electrical business is only the first step in the program of those who desire the ultimate nationalization of all industry, leaders in other lines of business should be rallied to the defense of our industry. At this time, as never before, relations between utility companies should be maintained on the most ethical basis. Utmost co-operation, rather than to profit at the expense of a neighbor company, should be the aim of all.—T. O. KENNEDY.

The industry has constantly been striving to maintain the public relations which it has developed and further efforts along these lines will be continued. The question of public relations from the holding company standpoint is largely a local problem, but one which involves serious consideration of a company-wide nature. However, the maintenance of good service by a local company has been found to be one of the most important factors in maintaining a favorable attitude toward public service organizations.

During the period of stabilization of conditions through which the nation has passed the public utility industry must be on the alert for opportunities to improve its present status and to move forward as rapidly as general conditions may permit. Combined with the concentrated effort which has been made to improve service and extend facilities, consistent efforts have been made to reduce rates and to operate harmoniously under regulatory conditions. It would seem advisable that the industry should try to demonstrate more fully that proper state regulation is adequate, for we have found that the utilities are willing to go to great length with state regulatory bodies in clearing up this question and to make present regulatory methods more effective and more easily applied and understood.

There are many reasons why the electric and gas utilities will progress substantially during 1931 and that the industry is in a position to move forward with the general improvement that is anticipated during the new year in general industrial, agricultural and commercial conditions.—JOHN J. O'BRIEN.

Home and Farm Markets Offer Greatest Opportunities

By F. A. MERRICK

President Westinghouse Electric & Manufacturing Company

EACH month that passes brings us nearer the time when the upturn in business will appear, and in that sense we are that much further ahead.

American living and wage standards are not too high. The possibility, however, of retaining them on present, or better, levels must have an economic foundation, and that can be found only in the same factors which produced it, namely, tackling the problem of production in a large way, along with sufficient ingenuity of apparatus and method, to the end that cost of production is low while the earnings of the individuals of the producing organization are high. Competition in important foreign industrial countries is currently reported to be lowering the nominal wage rate, though not necessarily the living scale, taking into consideration the decidedly lower price level of raw material and commodities in general, and it is not impossible, if this condition continues for a long period, that similar consideration might be necessary in this country.

Speaking specifically of the electrical business, it does not appear that the market is saturated, as there are still numerous applications for electricity which will come about in furthering required economies and convenience in industry, in transportation, on the farm, and in the homes. Of these I think the greater rate of progress may be expected in applications for the homes and on the farm, and these at present appear to be the greatest fields for expanding results both to the utilities and to the manufacturers, through continuation of close co-operation between these two branches of the electrical industry.

Insist That We Maintain

Leading executives in electrical manufacturing believe in the stability of American business

O. H. Falk

TOPICS DISCUSSED:

1. Are living and wage standards too high?
2. Are markets surveyed and saturated?
3. What major opportunities should be grasped?
4. How can sales be increased economically?
5. How can utilities and manufacturers co-operate?

R. J. Russell

AT THE request of ELECTRICAL WORLD several executives of manufacturing enterprises discussed important industry topics. Their comments give a cross-section of opinion in this important branch of the industry.

1. Are American living and wage standards too high and can they be maintained?

In the interest of general prosperity, I believe that our present standards of living and wages should be maintained.—OTTO H. FALK, *president Allis-Chalmers Manufacturing Company.*

As regards the general average for the country—No, and I hope they may be maintained. They will be under severe pressure if, as the news indicates, living standards in the rest of the world are being reduced. Such reduction of the price of labor elsewhere will tax the ingenuity of Americans if we are to maintain our own standards while selling in competition with the world.

Great inequalities now exist in America between the daily compensation of different classes of workmen of comparable skill and experience. The force of events may somewhat reduce these disparities, resulting in an increase for some, a decrease for others. There are also, of course, great differences in the living standards of individuals of the same earning capacity. The man who spends all he earns in a good year is probably spending less now, but his scale of living will return with prosperity. As for the less conspicuous multitude who create the country's great savings totals, their scale of living is probably not so much affected.

These basic premises seem sure: That the American standard of living has long advanced rapidly; that the economic factors which permitted this are still in force; and that the American family will always push its standard upward.—A. W. ROBERTSON, *chairman Westinghouse Electric & Manufacturing Company.*

I believe that the aggressiveness of American sales organizations, coupled with research, analysis and diligence in manufacturing, will lower the unit cost of production, affording more opportunity for all to receive greater values for moneys expended, thus tending to maintain or improve American living standards.—G. A. BURNHAM, *president American Brown Boveri Company.*

I do not believe that our American living and wage standards are too high, but that every effort should be made by the employers to maintain the standard that is now prevailing throughout the country.—L. E. MAYER, *president Electragists International.*

I do not expect any material reduction in our present wage and living standards. I believe they are not temporary, but are based upon sound, permanent growth, representing a revised plan attained by the greatly increased and diversified production of wealth in this country since the upward scale commenced.—W. K. VANDERPOEL, *vice-president Okonite Company.*

Those claiming that present American living standards

Living and Business Standards

Suggest co-operative steps and point out business opportunities for the industry

A. W. Robertson

DISCUSSIONS BY:

Otto H. Falk
A. W. Robertson
R. J. Russell
G. A. Burnham
E. F. Weston
H. W. Young
W. K. Vanderpoel
B. W. Kerr
C. L. Matthews
L. E. Mayer

G. A. Burnham

cannot be maintained are looking through dark-colored glasses. Before long the real position of business in this country will dispel their present point of view.—H. W. YOUNG, *president Delta-Star Electric Company.*

We do not believe that our American living and wage standards are too high and cannot be maintained. There are certain classes of labor that are out of line both as to wages and work produced. These industries will have to reduce the cost of labor, either through greater efficiency or by actual wage cuts. If they insist upon maintaining their present level it will be necessary for them to wait until the rest of the community increases its earnings a sufficient extent to more or less offset the difference now existing. If this latter procedure is followed, it is obvious that conditions in these high-priced trades will not be particularly good.—E. F. WESTON, *president Weston Electrical Instrument Corporation.*

I do not believe American living and wage standards are too high, viewing the matter broadly. They may be in some few industries, but there will undoubtedly be a leveling out for economic reasons.—R. J. RUSSELL, *vice-president Century Electric Company.*

The electrical industry has done more than any other to advance the American standard of living, and this standard is the world's strongest bulwark against the tide of communism. It must be maintained at all cost. —B. W. KERR, *president Railway & Industrial Engineering Company.*

2. Has the market for electrical manufactured products been fairly well surveyed and saturated so that only normal increases can now be expected?

I believe the market for electrical manufactured products has been quite well surveyed and that the market has been fairly well saturated with some items, but there is an exceedingly large market for other items. —R. J. RUSSELL.

We believe that the market for electrical products has been very well surveyed, but do not think that it has been saturated so that only normal increases can be expected. In fact, we anticipate that a large number of new devices will be developed during the next few years which will create a demand distinctly above normal. —E. F. WESTON.

In my opinion we have hardly scratched the surface in the use of electric service, for as electrical appliances and equipment are developed for use in the home, the factory and the farms there will necessarily be increased demands for electric service, as well as generating, transmission and distribution equipment. We also have to look forward to the electrification of our steam railroads, so I believe that the manufacture of electrical products has a very bright future.—OTTO H. FALK.

In some well-trodden fields, yes. Generally, no. The national demand for such things as turbo-generators,

distribution transformers or street railway motors is not likely to double over night, but even these markets can hardly be called "saturated" as long as they increase faster than the population.

In general, electricity is full of scarcely touched possibilities. Some are already plain to see, while others are being created, as was radio, out of the research laboratory. No other industry has before it a field so nearly limitless.—A. W. ROBERTSON.

With the rapid increase in efficiencies of apparatus, machinery and processes in relatively short periods of time—from an economic standpoint alone—the new must constantly replace the old. Thus, with lower cost of production, greater opportunities will be afforded to distribute our product in established fields, and research in sales and manufacturing will open up new fields.—G. A. BURNHAM.

I do not believe that the electrical manufactured materials have reached the saturation point and look forward within the next six months to an active demand for electrical products.—L. E. MAYER.

Any reliable market survey will show that we are far from saturation in marketing electrical products. In fact, I think we are just arriving at stages which will afford both increased sales in existing products and the introduction of new devices. There is no reason to assume that we have reached a stopping point in a country-wide field whose surface has only been scratched, and where the possibilities of research and fabrication are so inviting to progressive American enterprise.—W. K. VANDERPOEL.

The electrical business knows where it is going and the direction arrow points to a steady and sustained increase in the consumption of things electrical. We are simply on a business detour and all detours end eventually. The general field is not saturated, and when a particular branch really approaches saturation a new one opens up. That is the history of the electrical business. —H. W. YOUNG.

3. What major business opportunities are available and how should they be grasped?

Heating of the home and office buildings with electricity. Electrification of the steam railroads and of the farms.—OTTO H. FALK.

There is a great future ahead and great progress can be made in the field of household water heating and household cooking. The further use of current for these purposes is entirely dependent upon the economics involved, and obviously every increase in the freight rates of coal and every decrease in the cost of current bring us nearer the point at which devices of the kind indicated can be economically used. We anticipate great development in this field during the next few years. —E. F. WESTON.

It is my belief that in the next few years we will see windowless factories everywhere! In the cities windowless hotels, residential apartments, stores and office buildings. In the last decade, the sciences of illumination, heating, cooling and ventilation have been so perfected that more comfortable, more healthful, more cleanly and more beautiful interiors can be built—if the age-old habit of insisting upon windows is broken. The economy of the windowless building is great.

First cost can be materially reduced as well as the time of construction. Windows must be continually painted, repaired and washed. They let in many impurities, such as soot, dust, disagreeable odors, distracting noise. They cause much waste of time by employees looking out at this and that. The fresh air fiends are continually bickering with the anti-draught crowd in the office.

Air can now be washed free of all impurities—cooled in summer or properly heated for cold weather. The most healthful amount of humidity can be put into it. It can be distributed all over the building and finally exhausted from the premises. This clean, properly conditioned air will prevent colds and most of the minor ailments that cause absences on the part of employees. It will eliminate fatigue due to impure air and too much heat or chill and too much or too little humidity. It will stop much destruction or spoilage of stock due to soot, dust, etc. Building insurance of all kinds will be reduced; fire, tornado, storm, liability, etc.

Such buildings are made easily possible because of the availability of cheap electrical power. Power companies should encourage their construction. They should construct some of them for their own use and for the use of their officials. These windowless office buildings, storerooms and residences will save money for the power companies, and when their customers see their advantages they will follow their example.

The possibilities of increasing the consumption of electricity are enormous.

The larger movie theaters have done this. Recently a very large factory in Fitchburg, Mass., has adopted this idea and pictures of it have appeared in newspapers all over the United States. The S.S. *California* of the Cunard Line is so equipped and has made its inside rooms more popular than outside rooms with experienced travelers. The Baltimore & Ohio Railroad has adopted the air-conditioning idea in its diners and the windows are sealed.

The practicability and economy of the idea has been well demonstrated. The power companies can add an enormous amount of 24-hour, 365-day loads to their systems by aggressively pushing and demonstrating its soundness.—CLAUDE MATTHEWS.

Though industry, generally, is fairly well converted to the electric motor, it is only beginning to awake to other uses of electricity—fabrication of steel by electric welding, electric heat and furnaces for products in which uniform high quality is essential, and the use of electricity generally, not merely as a motive power, but as a quasi-intelligent control—a field whose scope is scarcely realized.

There are very large opportunities in the home. Residences which make even reasonably complete use of electricity are rare indeed; there are none where electricity does all that it might. Electric refrigeration, electric air-conditioning and better lighting all offer conspicuous possibilities at present. The farm remains the industry's largest single opportunity, whose importance is increased by recent evidence of the biological possibilities of electricity.—A. W. ROBERTSON.

E. F. Weston

H. W. Young

W. K. Vanderpoel

By bringing to the attention of the industry the economic advantages of new apparatus and their applications. The mercury-arc rectifier is an outstanding example in its application to the chemical and railway field.—G. A. BURNHAM.

Our greatest business opportunity of today is the rehabilitation of plants now inadequately wired for both power and light. A special campaign on this form of industrial energy will add materially to the sales of electrical production.—L. E. MAYER.

The great immediate market for electricity and electrical products is the home. Further use of electricity in domestic life will further advance the standard of living and will provide the outlet for the production of many factories.—B. W. KERR.

There is much yet to be done to improve lighting application in homes, offices, hotels, clubs, and factories —a great improvement is due in street and highway lighting. A large market is ahead in railway electrification, farm service, industrial heat application, in welding, etc.—all of which will increase the demand for electrical equipment and supplies.—H. W. YOUNG.

I do not see anything ahead to cause us to center our hopes and activities entirely upon any two or three major opportunities, inasmuch as our attention is directed toward the revival of all business. The vital industries to which we must give help and leadership are our utilities, because they are the key to the growth of all industry.

For at least two decades the utilities have had the most to do in the general building up of the whole country, not only with their excellent service and reasonable rates, but because their initiative has stimulated every branch of research and manufacture. I see the best and biggest progress for the country achieved by standing back of our electric power, gas, transportation, telephone and other public utilities. With their unhampered development we are assured of every aspect of progress—new and better manufactured products, more profitable agricultural production, more complete and efficient utilization of our incomparable natural resources and more comfortable and healthful conditions of living. —W. K. VANDERPOEL.

4. Do you believe that much can be done to reorganize sales methods and mechanisms either to reduce the cost of distribution or to increase the volume of sales economically?

I believe that as time goes on considerable improvement can be made in our method of sales distribution, resulting in a reduction in cost, but this will require intelligent investigation and carefully laid plans. We cannot, however, overlook the fact that goods must be sold competitively and that each manufacturer will be obliged to solve his own distribution problems as those vary with the product sold.—OTTO H. FALK.

I believe that reduction in the cost of distribution is not a pressing problem in the United States. If too much good thought is diverted from creative work, merely to accomplish a minor retrenchment, we shall lose our vision for greater attainments and our minds and our business mechanism will be cluttered up with wattless features. It is to be hoped that the blue psychology, engendered by what is only a natural cycle of economic readjustment, will not have a dwarfing effect upon the broad scope and brilliant activities so prominently displayed here in the past twenty years.—W. K. VANDERPOEL.

We doubt whether much can be done to reorganize sales methods and reduce the cost of distribution. Undoubtedly these costs will be reduced in the course of time, but we can make no definite suggestions and believe that the situation will gradually solve itself through evolution.—E. F. WESTON.

Much is still to be done in simplifying sales methods and merchandising the cost in these departments is far out of proportion to the present-day cost of production. Progress is being made along certain lines, but the winner in the end will be he whose solution is the proper one.—B. W. KERR.

The same principles that have been so successful in decreasing unit cost and increasing output in manufacturing can be applied to sales.—G. A. BURNHAM.

I do not believe that it is possible to reduce the normal cost of sales distribution, but that by more careful study

of employing sales forces, their ability to sell and their knowledge of the business in which they are engaged will materially add to the volume of sales and thus produce an economical sales standard.—L. E. MAYER.

Yes, in those cases where the present distribution organization is complex and involves many steps. Much improvement along these lines is, of course, hardly to be looked for in simple transactions, such as the sale of a large generator, which passes directly from the builder to the user. Complex sales organization is not in itself necessarily bad, but it offers many points instead of one at which inefficiency is possible. Any such improvement should necessarily be a co-ordinated one between buyer and seller.—A. W. ROBERTSON.

5. What major opportunities for co-operation between utilities and manufacturers for business development do you believe to exist?

Closer relations between the executives and engineers of the utilities and manufacturing companies in order that each may be informed as to the others' needs.

Scheduling of purchases on the part of the utilities so as to give the manufacturer a more even flow of business throughout the year, resulting in more regular employment by the manufacturers, which in turn redounds to the benefit of the utilities from the standpoint of factory and domestic current consumption.—OTTO H. FALK.

Opportunities for co-ordinated work between utilities and manufacturers for business development are always with us. But this is no problem, as it is naturally assumed that the effective co-operation of the past will be continued in the future. The manufacturers are most desirous of co-operating, as they know that the best mutual results are dependent upon giving good service and in developing products which meet the ever-expanding and changing needs of the utilities. They also know that the surest way to produce any reliable electrical equipment is by joint study in the field with the men who have to operate that equipment.

At this time I would be glad to add a comment on the fallacy of buying electrical equipment on a strictly price basis and without the fullest consideration to the over-all economy afforded by products of high quality. The experience of the industry has repeatedly taught the false economy of using anything but the best equipment in electric plant construction. History will repeat itself in this respect, and whether it be during a period of depression or in better times, the purchasing of absolute quality remains the only certain assurance of reliable service and reduced maintenance charges. This is axiomatic, as the imperative need of high standards in plant construction does not permit it to be built down to prices.—W. K. VANDERPOEL.

Viewing the matter from a broad standpoint, and by no means intending to criticise many central-station operators, I think there can be a policy established that will promote the growth of sales of electrical appliances through the maintenance of fair prices that will make it worth while for the trade to exert a very definite effort to sell, thus augmenting the central station's effort to increase the sale of current.—R. J. RUSSELL.

To my mind a most necessary accomplishment to improve the present business situation must be the promotion of more co-operation and tolerance between utilities and manufacturers in regard to their respective contributions to the development of the electrical industry. Too little recognition is shown by the utilities for the effort, time and money spent in the development of new equipment and in the improvement of old designs. These factors are as responsible as any other for the high degree of service afforded by the utilities to the public. Too often the buyer for the utility is only concerned with the price difference in proposals and neglects all comparison as to research, reliability and responsibility on the part of the various bidders. This neglect in consideration of essentials on the part of the buyer is unfortunately on the increase in the present buyer's market.—B. W. KERR.

The co-operation between the utilities and the manufacturers is already so well developed that it is difficult to suggest any major opportunities that have not already been covered. However, we believe this co-operation will be gradually developed to the mutual benefit of both parties.

In conclusion, let us say that in spite of all that has been done in the development of our industry, we are firmly of the belief that it is still in its infancy and that

B. W. Kerr

L. E. Mayer

C. L. Matthews

development during the next ten years will be nothing less than startling.—E. F. WESTON.

Further education of the public as to the advantages and economies of electrical devices for the home and industrial use. Such a program should receive the support of utilities, electrical manufacturers and suppliers of raw material.—G. A. BURNHAM.

I believe that the greatest opportunity for co-operation between utilities and manufacturers for the development of future business is for the average utility to realize that the rate for current normally charged to the consumer for appliances and light is far too high for the average wage earner, and that much effort should be made by utilities to reduce the cost, which would stimulate sales of appliances in the home, thus producing more sales by the manufacturer.—L. E. MAYER.

Responsibility rests on both utilities and manufacturers to absorb as much as they can of the impact of the present depression. To this end the Westinghouse company has been increasing its stocks, manufacturing standard products at a rate in some cases 50 per cent in excess of sales.

To minimize the discharge of employees, work has been distributed among them by rotation, each man working part time. Neither of these policies, of course, can be carried beyond a certain point.

Far greater power for good lies in the hands of the operating companies in general, in the expenditure of reserve funds to provide, now, the expansion of plant and facilities which are certain to be needed, with the return of prosperity. Public utilities are fortunate in being able to predict their growth with some certainty, as is the telephone industry.—A. W. ROBERTSON.

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1931—A Year to Build

By CLARENCE L. COLLENS
President National Electrical Manufacturers' Association

A YEAR such as 1930 is productive of solid thinking, and solid thinking at any time is essential to future progress. It is during such a period that we need the maximum of intelligence and sound business judgment in the conduct of each individual business. We need every safeguard which will promote stability in business, remove speculation and let whatever readjustments are necessary progress in an orderly manner. Unnecessary optimism, just as unnecessary pessimism, does not promote an orderly recovery.

Very little in the nature of real encouragement can be said about the prospects for business during the year 1931. The business recession of 1930 proved more serious than was generally anticipated. Instead of being one of relatively minor proportions, as expected at the beginning of that year, it turned during the last half of the year to a major depression. Certain branches of the electrical manufacturing industry, especially in many types of apparatus, have only felt its full effect during the past two months, as the low and high spots in the business cycles for electrical apparatus lag several months behind the corresponding points in the curve of general business.

The favorable factors are ample credit at low rates, depleted stocks, both of raw materials in the hands of manufacturers and of finished products in the hands of distributors and retailers; very general liquidation of the prices of raw materials and commodities, and a probable improvement next year in the aggregate volume of building construction and of automobile production. The unfavorable factors are that the depression is worldwide, accompanied by political unrest in many countries, excess productive capacity in most industries, a materially decreased current purchasing power caused by continued unemployment, the fact that a considerable proportion of the public is still paying for, or suffering from, the stock market losses of November, 1929, and the further liquidation of this last fall, and that there is not being injected into the situation any major demands which are ultimately financed over a long period of time or in the future, such as the war business following 1914 or major building construction operations. Neither is there being created any major new industry such as was caused by the introduction of automobiles and radios.

Improvement must rest very largely on a gradual increase in current purchasing power. There is, however,

a good volume of current purchasing power, both individual and in connection with business enterprises, and nothing will be gained by the postponement either of the purchase of actual current requirements or of the release of programs which must proceed in the near future.

Although the year 1931 gives little encouragement for immediate prosperity, it is a year in which the foundation can be laid for future prosperity. This means modernization of every character—machines, methods, markets, and men—and applies not only to the manufacturing end of a business but to the engineering, research and selling ends as well. It includes a review of sales programs, products and personnel, a search for new products and new uses and improved efficiency and effectiveness on the part of each person in the entire organization.

The year 1931 need not be one of discouragement to any business enterprise, provided each approaches the present business situation with aggressiveness and courage, and lays a solid foundation for the future.

Under the leadership of President Hoover every effort is being made to stabilize the business cycle, make the swings less violent and prevent serious unemployment. There is one phase of business operations, however, which is not emphasized, and that is stability in respect to price levels. It is just as important to remove violent price fluctuations and speculations in the raw materials, commodities and finished products generally purchased as it is to effect greater stability in the volume of production and the business cycle. Purchases never reflect the normal unless there is reasonable assurance that the current price levels are stable. Destructive competition, which forces prices down to uneconomic levels during business depressions, or the raising of prices to artificial heights during business booms both have a harmful and disturbing influence on the normal flow of trade.

The element of speculation may be necessary in respect to securities, as securities represent cash and must have an immediate market at all times. Speculation may force security prices too high during bull markets or too low during bear markets, but without the element of speculation it is doubtful whether an immediate market for this form of cash could be maintained. Speculation, however, in respect to raw materials, commodities and finished products is not necessary to create a market and in no way affects final ultimate consumption or demand.

Stability in price levels

Buyers generally are glad to have the element of speculation removed from the products which they purchase. They merely wish to be satisfied that they are buying as low as anybody else under similar conditions, and that prices will not be materially lower in the near future. Stability in price levels does not mean that prices remain at a fixed constant level, as market levels always reflect basic conditions and fundamental changes in cost, but stability merely means that under any given condition of supply and demand or cost there will be greater stability in respect to current prices.

Commissions and committees are studying the question of stability of supply and demand and unemployment, but greater stability in price levels can be effected only through the exercise of sound business judgment and intelligence on the part of each executive in the conduct of his individual business. The maintenance of a firm price policy by each individual executive is even more important during a period of business depression than in a period of prosperity and promotes stability of supply and demand and an orderly recovery.

President Hoover has also advocated in his recent message to Congress some inquiry into the economic working of the anti-trust laws, limiting this, however, to our natural resources, such as coal and oil. He called attention to the wasteful and destructive practices in these industries, to the desirability of conservation of all natural resources and to the general effect of destructive competition. But if any changes are desirable, and I am not convinced that they are, why limit this to the *natural* resources? Overproduction and destructive competition in any industry are wasteful and endanger one of the principal resources which we have, namely, the capital investments on which our industrial growth and the general confidence in business enterprises depend. Capital is no longer concentrated in the few, for the public generally are investors, including employees in industry and all classes of our citizenship.

Adequate statistics needed

Stability in all the phases discussed is impossible without adequate statistics. If we are ever to attain some leveling of the extremes now existing in the business cycle, and greater continuity of employment, it will be based on comprehensive knowledge of the facts. It is almost the public duty of each individual business enterprise to contribute such facts to the industry of which it is a part as will promote greater stability. Immediate results cannot be expected, but with adequate statistics, regularly collected, we will be better able to gage at some time in the future normal demands and trends and minimize unemployment. If the facts are backed up by the necessary intelligence and sound business judgment on the part of each business executive, it will also contribute toward greater stability of prices, the avoidance of serious overproduction or serious overexpansion of productive capacity.

All that has been said regarding an individual business enterprise applies equally to trade associations. The year 1931 is a year in which the National Electrical Manufacturers' Association should promote through education, stability in all its phases, develop adequate statistics for the electrical manufacturing industry without which stability is impossible, and in co-operation with other branches of the industry lay the foundation for trade extension programs and future prosperity. It should so conduct itself that it will command the confidence and respect of its own members and of all other branches of the industry which it serves.

I am an optimist regarding ultimate recovery, the future prosperity and continued growth of all industry in this country, and of the electrical industry in particular.

Light and Power Progress in 1930

By W. A. JONES

President National Electric Light Association

THE electric light and power industry has continued an orderly development during the year 1930. The latest available information indicates that the industry has spent in new construction more than $900,000,000, or approximately $100,000,000 more than was spent for expansion in the year 1929.

More than 500,000 new domestic consumers were added to the lines during the year and 120,000 additional farms were electrified, bringing the total number of domestic customers to 20,500,000 and the total number of farms electrified to 680,000. This represents a gain in farm electrification of more than 21 per cent, the largest number of farms electrified in any single year since the movement began.

In a year when many industries have been undergoing a period of readjustment and when many have suffered from overproduction, we have no better example of the confidence of the leaders of the light and power business than that which has been displayed in the investment of almost $1,000,000,000 of new capital, satisfactory returns on which must come through increased business in future years.

The year has seen further adjustment downward in rates for service in many parts of the country, and as the year closes we find the industry employing more men than ever before, and in no cases on record have we seen wage cuts.

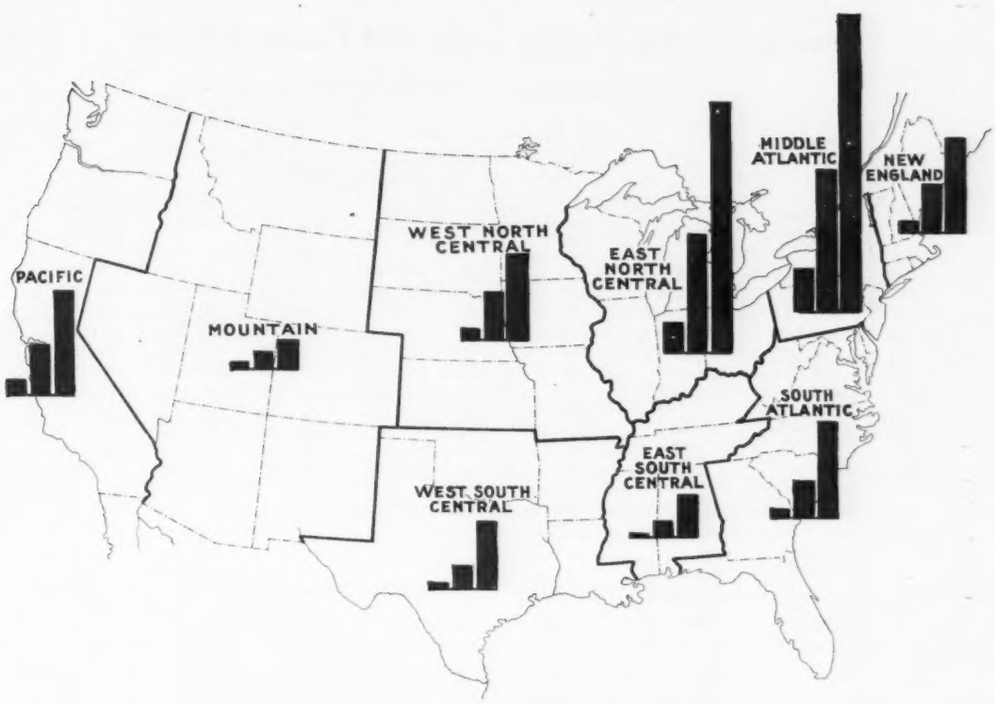
Nowhere in the light and power business have we seen any diminution of faith or courage in the future of American business, and no industry in America has done more to insure the speedy return of satisfactory business conditions.

Outstanding Facts

Figures are on electric light and power industry for the year's operations or as of the end of each year

	1912*	1917*	1922*	1927*	1928	1929	[1]1930
Capital invested, aggregate ($1,000)	2,289,622	3,245,185	4,817,000	*9,500,000	10,300,000	11,100,000	11,800,000
Securities sold ($1,000)*	.....	.....	719,961	2,152,527	1,653,180	1,468,895	1,587,854
by investment houses ($1,000)*	.....	.....	589,961	[3]1,889,000	[3]1,471,498	[3]1,315,459	[3]1,452,854
direct to customers ($1,000)*	.....	.....	130,000	263,527	181,682	153,436	135,000
REVENUE, total gross ($1,000)	302,116	526,894	1,072,120	1,963,664	.....	.....	.....
for electric service ($1,000)	[4]286,981	[4]502,060	[4]1,020,439	1,802,655	1,941,955	2,105,900	2,155,00
domestic ($1,000)	221,200	402,263	842,566	546,809	601,490	654,830	705,000
small light and power ($1,000)				500,058	535,500	591,700	625,000
large light and power ($1,000)				478,779	513,500	552,500	510,500
municipal street lighting ($1,000)	29,777	36,652	49,151	77,199	84,150	91,800	96,300
railroads and railways ($1,000)	31,020	53,524	48,444	64,200	64,770	65,150	64,500
other utilities ($1,000)			75,011	135,610	142,545	150,020	153,700
from other sources ($1,000)	15,135	24,834	51,681	161,009	.....	.....	.....
EXPENDITURES							
Additions and extensions ($1,000)*	.....	.....	324,016	760,353	786,977	866,344	960,190
Operating, total[2] ($1,000)	151,270	308,214	533,068	828,168	866,350	934,890	950,700
Salaries, average ($ per year)	771	902	1,409	1,561	.....	.....	.....
Officers	1,760	2,211	3,287	[7]1,735	.....	.....	.....
Superintendents and managers	1,353	1,662	2,415		.....	.....	.....
Clerks	731	825	1,344		.....	.....	.....
Wage earners	692	833	1,312	[7]1,450	.....	.....	.....
ENERGY							
Output (1,000,000 kw.-hr.)							
Generated by central station companies	11,569	25,438	43,560	74,686	82,927	91,421	90,076
from fuel	.....	.....	26,573	45,968	49,419	59,031	58,882
from water power	.....	.....	16,987	28,718	33,508	32,390	31,194
Imported, net	.....	*1,225	*862	3,772	2,936	2,669	2,950
Total generated and imported	11,569	26,663	44,422	78,458	85,863	94,090	93,026
SYSTEMS, STATIONS, RATINGS, ETC.							
Number of establishments	5,221	6,542	6,355	4,355	4,063	[8]2,801	[8]2,755
Commercial establishments	3,659	4,224	3,774	2,137	2,153	[8]1,480	[8]1,379
Municipal establishments	2,581	2,318	2,581	2,198	1,910	[8]1,321	[8]1,376
Companies generating	4,714	5,124	4,389	2,331	2,394	[8]1,699	[8]1,575
purchasing all energy	507	1,418	1,966	2,004	1,669	[8]1,102	[8]1,180
Operating systems with 100,000,000 kw.-hr. output	.....	.....	6	124	135	137	.....
Generating plants, total number	5,221	6,542	5,444	4,801	4,352	4,250	[8]3,873
Commercial	3,659	4,224	3,615	3,589	3,232	3,190	[8]2,863
Municipal	1,562	2,318	1,820	1,207	1,120	1,060	[8]1,010
Generator rating (kw.)	5,165,439	8,994,407	14,313,438	25,811,305	27,698,305	29,558,637	31,836,243
Estimated equivalent kva.*	6,450,000	11,230,000	17,960,000	29,629,000	31,796,822	33,900,000	36,620,000
Prime movers (hp.)	7,530,044	12,936,755	20,296,235	35,710,128	39,069,800	41,551,800	43,420,000
Steam engines and turbines (hp.)	4,949,778	8,449,076	14,171,222	25,317,577	27,360,000	29,512,000	30,800,000
Water wheels (hp.)	2,469,231	4,277,273	5,822,018	9,844,263	11,119,800	11,439,000	11,820,000
Internal combustion engines (hp.)	111,035	210,406	302,995	548,288	600,000	600,000	600,000
Water power, all uses (hp.)*	4,770,000	6,800,000	8,270,000	12,296,000	13,571,530	13,807,778	14,790,000
Transmission (circuit miles)	.....	.....	86,290	185,449	†204,000	†225,000	†245,000
Employees, total	79,335	105,541	150,762	251,020	†265,000	†279,000	†285,000
FUEL CONSUMPTION							
Coal and coke (short tons)	.....	21,565,273	26,130,865	37,500,630	37,593,322	41,406,000	39,393,000
Oil (bbl.)	.....	6,158,219	11,855,969	7,145,798	6,852,352	9,740,000	8,646,000
Gas (1,000 cu.ft.)	.....	14,199,204	20,174,385	65,522,792	77,054,261	112,442,000	121,281,000
ENERGY DISPOSITION (1,000,000 kw.-hr.)							
Sales, domestic	2,572	4,530	9,560	*8,073	8,970	10,320	11,640
small power and light				*12,483	13,480	15,350	16,250
large power and light	3,254	12,560	20,620	*34,543	38,600	42,350	39,300
municipal lighting	([6])	([6])	([6])	1,741	1,816	2,022	2,120
railways and railroads	3,017	4,400	5,642	6,772	6,750	7,020	6,810
company use and losses	2,546	5,140	8,600	14,845	15,559	17,028	16,906
CUSTOMERS							
Total number	3,837,518	7,178,703	12,709,868	21,786,212	23,153,252	24,147,183	24,701,972
Domestic lighting*	3,100,918	5,810,300	10,211,232	17,950,934	19,089,882	19,967,154	20,438,774
Commercial lighting*	605,600	1,125,200	2,030,324	3,358,140	3,532,489	3,598,115	3,663,946
Industrial power and other*	131,000	243,203	468,312	477,138	530,881	581,914	599,252
People in electric lighted homes*	14,000,000	25,250,000	43,100,000	75,500,000	81,500,000	85,000,000	86,500,000
Per cent of total population*	15.9	24.3	38.9	63.0	67.5	70.0	70.5

Data for 1912, 1917, 1922, 1927 are from U. S. Census Bureau, except those marked.
†Estimated, based on past growth or known plans.
[1]Estimated, generally on ten months' operations.
[2]Does not include interest, taxes, depreciation or sinking fund.
[3]Includes rights.
[4]Includes estimated value of free service, not tabulated below.
[6]Included in "lighting."
[7]Commercial companies only.
[8]Very small ones omitted, est. 600 private, 400 municipal.



Regional Growth in Revenue

The chart shows eighteen years' increase, and eight years' by these percentages respectively:

New England	565	87	East South Central	990	161
Middle Atlantic	587	107	West South Central	990	211
East North Central	699	109	Mountain	330	57
West North Central	537	73	Pacific	577	110
South Atlantic	1,145	167	United States	652	111

LIGHT AND POWER GAINS

"I know of no way of judging the future but by the past."—Patrick Henry, Speech in the Virginia Convention, March 23, 1775.

By G. F. WITTIG

Statistical Editor "Electrical World"

ELECTRIC light and power service is now afforded 24,700,000 customers in all parts of the country. This service is rendered by a national power supply consisting of a network of transmission lines endowed with steam and hydro plants having an aggregate capacity of 31,836,000 kw. The total investment in this branch of the industry is approximately $12,000,000,000 and the annual revenue $2,155,000,000. During the past decade nearly $7,000,000,000 has been spent for new plant and equipment and expenditures aggregating $11,400,000,000 are anticipated for the next decade.

During the past year the light and power industry increased its revenue compared with 1929—an exceptional business year — earning $2,155,000,000 against $2,106,000,000, with an energy production of 90,076,000,000 kw.-hr. against 91,420,000,000 kw.-hr. the year before. Domestic revenue increased notably, while rates fell. This record of the utilities is indicative of the stability of a business built upon diversified electric service and should give assurance to the already enviable investment standing of the industry.

Another feature of the year was the support the utilities gave to the program of President Hoover to maintain employment and expenditures at a normal level. It spent $900,000,000 for new plant and equipment and did everything possible to hold up standards of wages and employment in the communities it served.

Over a period of some thirty years the light and power industry has built its business on a sound basis of getting larger volume of sales through lowered rates made possible by aggressive selling and improvements in equipment and operations. It has built an efficient physical plant; it has established a splendid credit position; it

Revenue of the Electric Light and Power Industry by Sources—1920-1930

(Thousands of Dollars)

Year	Total Revenue from all Sources	Revenue for Electric Service						
		Total Rev. for Electric Service	Residential	Retail Light and Power	Wholesale Power and Light	Municipal	Railway	Other Electric Service
1920	882,750	882,720	223,500	185,400	337,500	39,320	42,000	55,000
1921	944,400	911,550	246,400	204,100	295,000	43,500	44,650	78,000
1922	1,072,120*	1,020,439*	275,890	231,888	334,788	49,151	50,750	77,972
1923	1,269,550	1,180,850	323,000	276,800	393,000	54,750	52,200	81,100
1924	1,354,520	1,322,000	381,400	331,000	402,000	60,700	54,400	92,500
1925	1,480,500	1,425,160	422,000	372,000	423,000	58,700	53,270	96,190
1926	1,652,300	1,621,550	485,500	435,500	459,000	68,450	58,100	115,000
1927	1,963,664*	1,802,655*	546,809	500,058	478,779	77,199	64,200	135,610
1928	.....	1,941,955	601,490	535,500	513,500	84,150	64,770	142,545
1929	.....	2,105,900	654,830	591,700	552,500	91,800	65,150	150,020
1930‡	.....	2,155,000	705,000	625,000	510,500	96,300	64,500	153,700

*U. S. Census. Allocation adjusted to distribute revenue reported as "undistributed."
‡ Estimated on basis of ten months' operation.

has become a high-grade investment entity; it has developed flexible capital structures; it has brought about efficient and logical consolidations to secure economies and it has promoted business policies that produced results contributing both to its own prosperity and to national progress.

From the point of view of future progress there is no doubt that sales holds a paramount position. The present services came to the utilities without great sales effort and might be called only the essential services in light, heat and power. In industry and in the homes there is little evidence of saturation in the use of electricity. Devices and processes are now available that, if sold and used, would more than double the business, and all this within the economic realm of consumer purchasing power and the intangible measures of so-called service values. These markets and new markets, however, must be sold through organized sales effort wherein the utilities, manufacturers, jobbers and dealers develop a method of distribution and sale that will be more economical and effective than existing practices. Several experiments involving radical departures from present commercial practices are under way that are promising.

Operating ratios and the cost of power generation have decreased steadily in the light and power industry in the past decades. In the same period, however, unit capital investments have increased steadily because of the rapid extension of service to low-load density areas and because the quality of service has been improved greatly. This trend has meant that the investment per dollar of gross revenue has changed from $5 in 1920 to $5.60 in 1930, while the gross revenue per customer has changed from $81 to $87 during the same period. Through improved load factor business, a greater volume of business and operating and installation economies the industry is trying to get more revenue per dollar of capital expenditure, and very promising opportunities to do these things lie on the horizon. The credit position of the industry has improved greatly in the decade, however, to offset the increased investment somewhat. The yield on utility securities in 1920 was about 8 per cent, as compared to a little more than 5 per cent in 1930.

A large part of the cost reduction in operation during the past decade has been brought about in fuel-burning power stations. The coal consumption has been cut nearly in half, from 3.0 lb. to 1.63 lb. per kilowatt-

Distribution of Central Station Energy, 1920-1930

(Millions of Kilowatt-Hours)

Year	Generated in Central Station Plants*	Total Including Energy from Other Sources	Distributed to Ultimate Consumers						Losses and Company Use
			Total	Residential	Retail Light and Power	Wholesale Power and Light	Municipal Use	Railway Transportation	
1920	39,519	40,469	32,530	2,950	4,140	19,997	723	4,820	7,839
1921	36,971	37,991	30,700	3,275	4,950	17,435	800	4,600	7,291
1922	43,560	44,422	35,822	3,670	5,207	20,403	900	5,642	8,600
1923	51,133	52,188	42,220	4,420	6,380	24,665	1,055	5,700	9,968
1924	54,413	55,813	45,000	5,270	7,710	25,995	1,225	5,800	10,813
1925	61,159	62,398	50,221	5,930	8,850	28,296	1,345	5,800	12,177
1926	69,158	70,664	56,964	6,950	10,530	31,849	1,535	6,000	13,700
1927†	74,686	78,457	63,612	8,073	12,483	34,543	1,741	6,772	14,845
1928	82,927	84,514	68,695	8,970	13,480	38,600	1,816	6,750	15,559
1929	91,421	94,090	77,062	10,320	15,350	42,350	2,022	7,020	17,028
1930‡	90,076	93,026	76,120	11,640	16,250	39,300	2,120	6,810	16,906

*Courtesy U. S. Geological Survey.
†Based on U. S. Census, Central Electric Light and Power Stations, with estimated allocation of energy reported as "undistributed by class of service."
‡Estimated on basis of ten months' operation.

hour, and yet there appears promise that this trend can be counted on to continue in some degree. Other cost-saving factors lie in the fact that the basic lines and plants are now installed and increment installations will predominate in future. Nor has bottom been reached in cost reductions through improved designs, equipment and better assembly plans.

Public Relations Accented

In some degree the effect of the current business depression and recent political agitation has been to focus upon the light and power industry the attention of those who believe in the socialization of all industry. This has resulted in unfounded rumors of adverse legislation that centered largely about water power. No serious effect can be anticipated because the movement has little backing and because water power is a small element in power production. Yet it is evident that this branch of the industry has a major task in developing a better understanding of its business by the public lest the present straw arrows become poisoned. An industry program for tangible public relations work within and without the industry is being developed and should help greatly in making a national policy with regard to the degree of public ownership and control advisable for large business enterprises.

A consumer now pays $15 in taxes for each dollar he pays for electric service; it is beyond belief that the public would face a present investment of about $12,000,000,000 in light and power enterprises, with a growth to $20,000,000,000 in 1940, with any serious idea that government could conduct a business of this magnitude efficiently or effectively. It would mean adding another World War debt to an already enormous national debt and would call for a still more unwieldy and wasteful government operating organization of some half million employees.

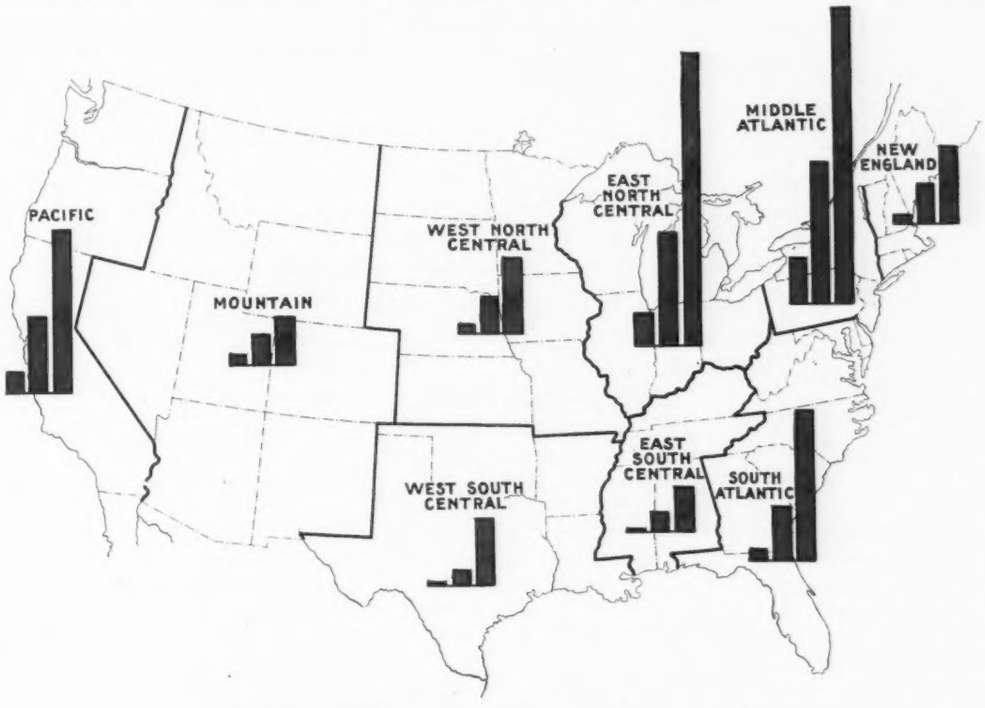
Sane and constructive work on public relations is needed, however, and this is in progress to the end that growth may be had without public friction or political harassments.

Power question to the fore

The power issue has become one of the outstanding political and public questions of the day, largely because advocates of the socialization of industry have focussed on this business. No fundamental change in national political policy with respect to business is anticipated, but the complexity of the light and power industry, its magnitude and its operations in all localities make it difficult to define the issue or to explain the business to the public.

Two major plans for socialization of industry are advocated:

1. Institute strict federal regulation.
2. Have public ownership and operation of water power. These two issues are taking tangible form in that federal regulation is advocated in the Cousins bill for interstate power and special national and state legislation is developing for water-power developments by



Regional Growth in Energy Generated

The chart shows eighteen years', increase, and eight years', by these percentages respectively:

New England	563	93	East South Central	1,345	132
Middle Atlantic	518	104	West South Central	2,040	390
East North Central	757	131	Mountain	323	61
West North Central	705	92	Pacific	543	110
South Atlantic	1,425	195	United States	677	122

Central Station Revenue for Electric Service by Regions, 1912-1930

(Millions of Dollars)

Region	1912	1917	1922	1927	1928	1929	1930
New England....	28.5	52.5	100.9	156.8	170.1	185.97	189.02
Middle Atlantic..	87.3	149.7	290.3	499.9	534.4	574.45	599.81
E. North Central.	63.4	114.8	241.9	435.6	470.7	511.90	505.89
W. North Central	27.5	50.8	100.9	150.3	159.1	169.23	175.09
S. Atlantic.....	16.1	30.1	75.3	169.7	180.9	193.90	201.64
E. South Central.	7.5	13.5	31.3	69.0	74.1	79.99	81.98
W. South Central	12.2	19.2	42.9	95.8	110.2	128.30	133.25
Mountain.....	13.8	26.1	37.6	52.7	55.7	59.10	59.36
Pacific.....	30.8	45.4	99.3	172.8	186.7	203.06	208.96
United States...	**287.1**	**502.1**	**1,020.4**	**1,802.7**	**1,941.9**	**2,105.90**	**2,155.00**

Central Station Energy Output by Regions, 1912-1930

(Millions of Kilowatt-Hours)

Region	1912	1917	1922	1927	1928	1929	1930
New England....	865	1.836	2.970	4.750	5.350	5.997	5.746
Middle Atlantic..	3.548	7.659	10.766	19.282	20.034	21.605	21.953
E. North Central.	2.528	5.757	9.368	18.212	20.537	22.786	21.614
W. North Central	713	1.776	2.969	4.549	4.816	5.387	5.732
S. Atlantic.....	730	1.745	3.789	8.445	10.362	11.763	11.104
E. South Central.	228	1.049	1.420	2.777	3.056	3.398	3.298
W. South Central.	234	483	1.041	3.275	4.027	4.890	5.009
Mountain.....	845	2.036	2.210	3.390	3.723	3.785	3.564
Pacific.....	1.878	3.097	5.759	10.006	11.022	11.810	12.056
United States...	**11.569**	**25.438**	**40.292**	**74.686**	**82.927**	**91.421**	**90.076**

states or the government. Muscle Shoals, the St. Lawrence, Hoover Dam, the recent legislation in Oregon and Washington, disputes over the personnel and jurisdiction of the Federal Power Commission are indicative of proposals and actions on water power.

Many problems to be solved

The issue of federal regulation is not of great importance from the selfish viewpoint of the industry. It would make uniform regulatory practices, and past experience indicates that federal courts hold strictly to constitutional law in dealing with business enterprises. Nor does the water-power issue threaten the industry except as these are steppingstones to a further socialization of the industry. It is to be expected that the old saying "a burnt child dreads the fire" will result from these experimental touches of government ownership.

Whether in engineering, management, finance or sales, there are many problems confronting the light and power industry. Correct solutions to these problems will expedite industry expansion, lower costs and improve public relations. The size and complexity of the industry make for slow progress and many problems are linked with other industry groups, but there is every reason to believe that solutions will be had. Some of the important objectives are as follows:

1. A greater degree of system planning whereby costs will be reduced through the use of standard equipment that can be produced in volume.

2. The development of a more effective and economical method for distribution and sales of light and appliances to homes in co-operation with other industry groups.

3. The invention of improved apparatus whereby costs of equipment and operation can be reduced.

4. The perfection of better organization whereby efficient and effective work can be done more uniformly in the industry.

5. The development and institution of more uniform and more equitable rate systems.

6. More uniformity in regulatory, safety and inspection laws and rulings.

7. A reduction in system outages, and consequently system investments, through a better knowledge and control of lightning and other hazards.

8. The institution of methods to secure greater sales of electricity to industrial plants and other power users.

Operating and Maintenance Expenses of Central Stations

(Millions of Dollars)

Including taxes, interest on funded and floating debt, depreciation and sinking fund

	United States	New England	Atlantic	North Central	South Central	Mountain-Pacific
1907.....	**134.2**	12.6	49.7	39.8	9.5	22.6
1912.....	**234.6**	21.4	84.1	76.4	15.0	37.7
1917.....	**426.6**	42.0	153.4	144.6	27.6	59.0
1922.....	**859.6**	83.0	309.0	296.4	58.8	112.4
1927.....	**1,318.3**	.....	.....	.....	.....	.....

Exclusive of taxes, interest on debt, depreciation and sinking fund

1917.....	**284.8**	29.7	107.8	99.6	17.6	30.1
1922.....	**553.0**	57.7	202.7	197.0	39.1	56.5
1927.....	**828.2**	71.2	308.2	282.9	85.8	80.1
1928.....	**866.3**	75.6	327.3	280.8	91.4	91.2
1929.....	**934.9**	79.7	340.4	315.6	102.9	96.3
1930.....	**950.7**	82.9	350.1	313.2	108.3	96.2

The year in detail

For several years the field of electric energy use that has been growing most rapidly has been the domestic. Of them all, this alone continued at almost the same rate as in 1928 and 1929. Sales increased by 13 per cent in kilowatt-hours, 8 per cent in revenue. The gain is emphasized by the fact that it was accompanied by the smallest change, 471,600, in number of domestic customers since the days when electricity was just beginning to make its way into the average home. Consumption per customer rose by 10 per cent. This progressive increase is important to the electrical industry, as well as socially, for it reflects the habits in 20,000,000 American homes.

The residential increase came in the face of a 1 per cent reduction in total output, for the first time since 1921, when the production was also less than in the preceding year.

Deducting energy lost in transmission or consumed for company purposes, the 11,640,000,000 kw.-hr. for domestic use constituted 15.3 per cent of the 76,120,000,000 kw.-hr. total sales, against 13.4 per cent in 1929. Retail energy, 16,250,000,000 kw.-hr., was 21.3 per cent, against 19.9 per cent; wholesale energy, 39,300,000,000 kw.-hr., fell to 51.7 per cent, from 55 per cent.

It was in the last-named item that the industrial depression made itself felt, for while residential and retail sales increased by 13 and 6 per cent respectively, power sales dropped by 5.6 per cent, the 3,000,000,000 kw.-hr. lost more than absorbing the gains in the other two major categories.

Gross revenue increased 2 per cent. Reduction of rates, particularly for domestic use, is again revealed by the smaller increase in revenue than in kilowatt-hours. In 1930 residential revenue was $705,000,000, nearly

33 per cent of the total, against $654,000,000, or 31 per cent, in 1929. The apparent increase was exaggerated by the reduction in wholesale power sales, which source of revenue fell off 7 per cent.

A retrospect and a prospect

Domestic consumers continue to be by far the largest class. Of the total of 24,700,000, five in every six are domestic consumers, one in seven is a retail commercial user, and the small remainder, 3 per cent of the whole number, are power and miscellaneous customers. The residential service now reaches 70 per cent of the families in the United States, and if allowance is made for that portion of the population living on our 6,000,000 farms and not yet within economic reach of central station lines the percentage for the others is much greater. Of our people living on farms roughly 10 per cent are served; of those not on farms, 86 per cent. Comparatively few urban American homes now lack electric light and other electrical conveniences.

The electrical industry must continually build for the future. It must build modern plants for greater efficiency in power generation. It cannot permit its construction program to lag because of a temporary sag in the demand.

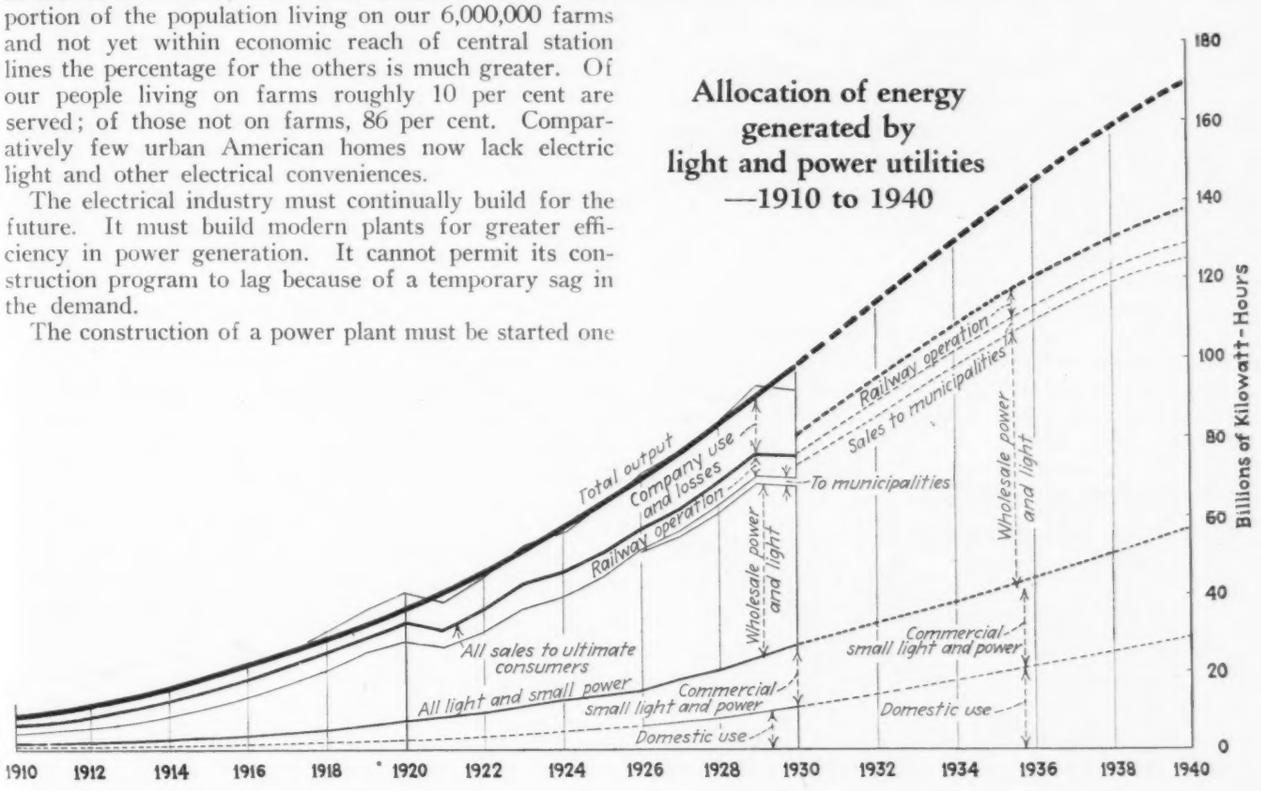
The construction of a power plant must be started one or several years before it can begin to feed energy to the line; 2,789,437 kw. in new construction was reported in 1930, not far from three-fourths of it steam, a small amount driven by internal combustion engines, the remainder by water power; about one-fifth of this replaced old equipment, but most of it constitutes a net increase in capacity. Toward the end of the year a floating power plant, to be towed wherever it might be needed, was put into service in New England.

Of the total plant capacity now in use, 23,331,220 kw. is steam driven, 8,100,594 kw. is hydro-electric, 404,429 kw. is driven by internal combustion engines in plants of more than 100 kw.; this figure would be somewhat increased by adding the installations in numerous small plants, especially in the agricultural states. Thus 73 per cent is driven by steam and 25 per cent by water power.

This power plant construction has been accompanied by corresponding additions in transmission, substation and distribution systems, including considerable activity in putting the latter under ground.

Ten years ago a review of the history of the industry would have permitted a reasonable estimate to be made of its probable magnitude in 1930. Its revenue for that year was $882,720,000; its output was 40,469,000,000 kw.-hr.; it had 9,899,000 customers; 35 per cent of the nation's homes had electric service. The major statistics were known as far back as the census of 1902.

Nevertheless, it would have required courage to predict a 2.4-fold increase in revenue, a 2.5-fold gain in number of customers and an increase from 2,950,000,000 kw.-hr. of domestic energy sales to 11,640,000,000 kw.-hr.—a fourfold growth and an increase from 339 kw.-hr. per domestic customer to 570 kw.-hr. After such a prediction the slump in 1921 would have assured the pessimists of its absurdity.



In the face of this consideration, an analysis of the past decade's growth has been made with a view to estimating future prospect. Published statistics did not afford data classified in the same detail as the census of 1927, for energy, revenue and number of customers, and compiled from company reports for more recent years. In the light of available information the census figures and ELECTRICAL WORLD figures for earlier years, from 1920 to 1926 inclusive, were therefore broken down to agree with current classifications. The results appear in several of the accompanying tables. They represent the probabilities, as well as those that can be established, and are believed to be essentially correct.

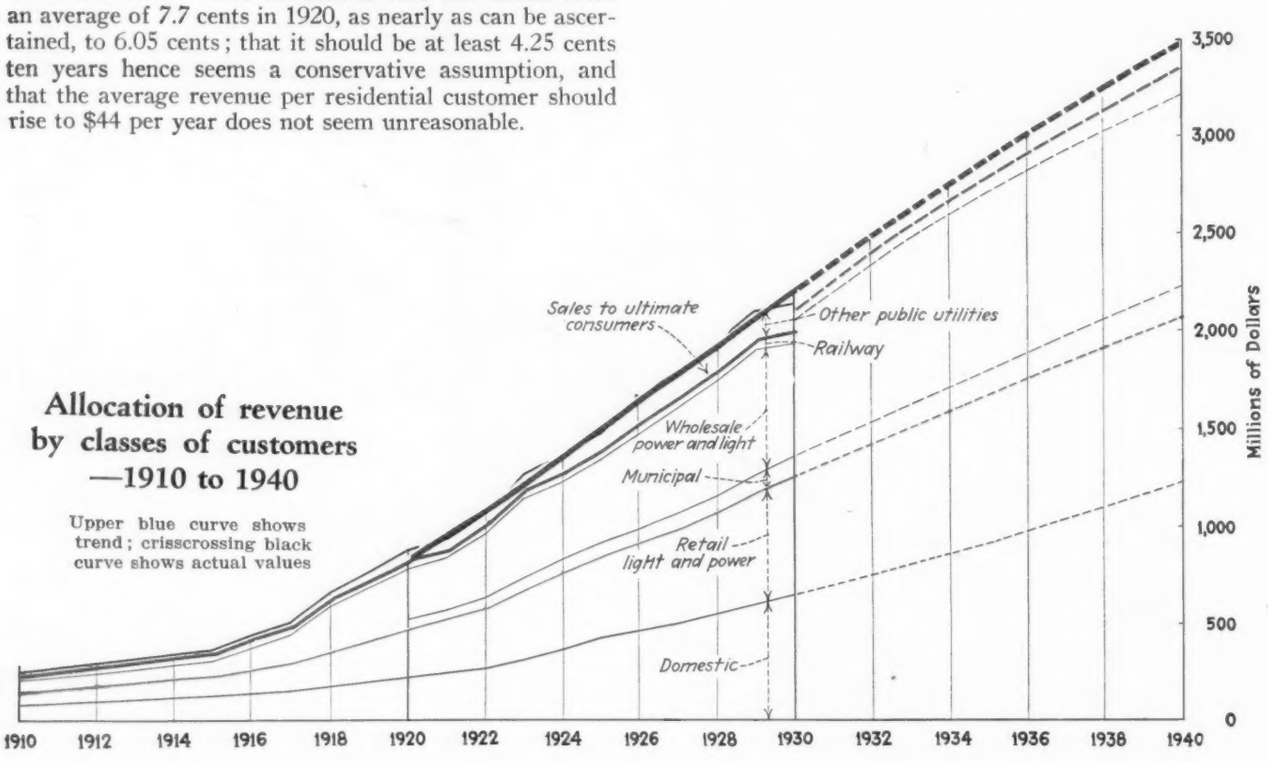
Based on this analysis, an estimate has been carried forward to 1940. Whether the forecast will be reached in that year, or a little earlier or a little later, is immaterial. It results in the following estimates for energy output and revenue:

	Millions of Kw.-Hr.	Revenue, Millions of Dollars
Domestic service	29,000	1,230
Retail light and power	25,000	845
Wholesale power and light	71,000	975
Municipal light and power	4,000	160
Railway transportation	8,000	80
Sales to other utilities	.....	150
Company use and losses	32,000	....
Total	169,000	3,440

This represents 84 per cent increase in energy output, against 122 per cent during the past decade, with the former figure exaggerated and the latter depressed by the abnormality of 1930. It represents 59 per cent more revenue than in 1930, against a rise of 144 per cent in 1930 over 1920. The residential rate has fallen from an average of 7.7 cents in 1920, as nearly as can be ascertained, to 6.05 cents; that it should be at least 4.25 cents ten years hence seems a conservative assumption, and that the average revenue per residential customer should rise to $44 per year does not seem unreasonable.

power. In the home greater use of appliances, more energy consumption, larger bills at lower rates now go hand in hand. What the photo-electric cell or some other form of electron tube may bring is problematic. What may happen in the way of lighting, including provision for ultraviolet radiation, or what new conveniences may be introduced, we cannot tell. But that they will be accepted, whatever they are, and that they will be electrically operated, is reasonably certain.

In factory operation continued motorization, though at a gradually decreasing rate, is to be expected. New alloys to be used in aviation and elsewhere will presumably call for electrothermal and electrochemical process. Chemical and metallurgical progress will demand electric power for other purposes.



Equally moderate assumptions, based on past trends, have been made for the other classes of service. For wholesale power an increase of 64 per cent has been assumed over the energy consumption of 1929, against 112 per cent for that year over 1920.

In 1920 the general introduction of radio sets connected to lighting circuits could not have been anticipated; no estimate could have been made of the energy to be consumed by electric ranges, water heaters, refrigerators and certain other appliances. Nor could the addition in our industrial plants of 1,000,000 hp. annually in motors driven by purchased energy have been foretold with confidence. But while the details were concealed behind the veil of the future, the general rate of growth approximating that of the past could have been foretold.

Advance it ten years. Again the details are concealed, but the mass effect can be foretold. We can be sure that innovations will be introduced, and that whatever the innovation, it will probably call for more electric

It has been predicted that steel will replace wood in house construction. If so, electric welding will load lines during off-peak periods in residential areas. Welding may also increase consumption in other districts.

The expected growth in output indicates the need of 20,000,000 additional kilowatts of generators by 1940, bringing the total well over 50,000,000 kw., with corresponding extensions to transmission and distribution circuits. Disturbances, political interference, unwise leadership in the industry, may at some point retard the program. Nothing short of a cataclysm can permanently halt it. Modern industry and modern living, in the United States at least, are built around the assumption of electrical energy supply. It has become a necessity.

A survey of the past decades in every phase of utility operation shows a steady improvement and there is every reason to look for continued progress in the future. A broad perspective and more unity in thought and action are the needed values.

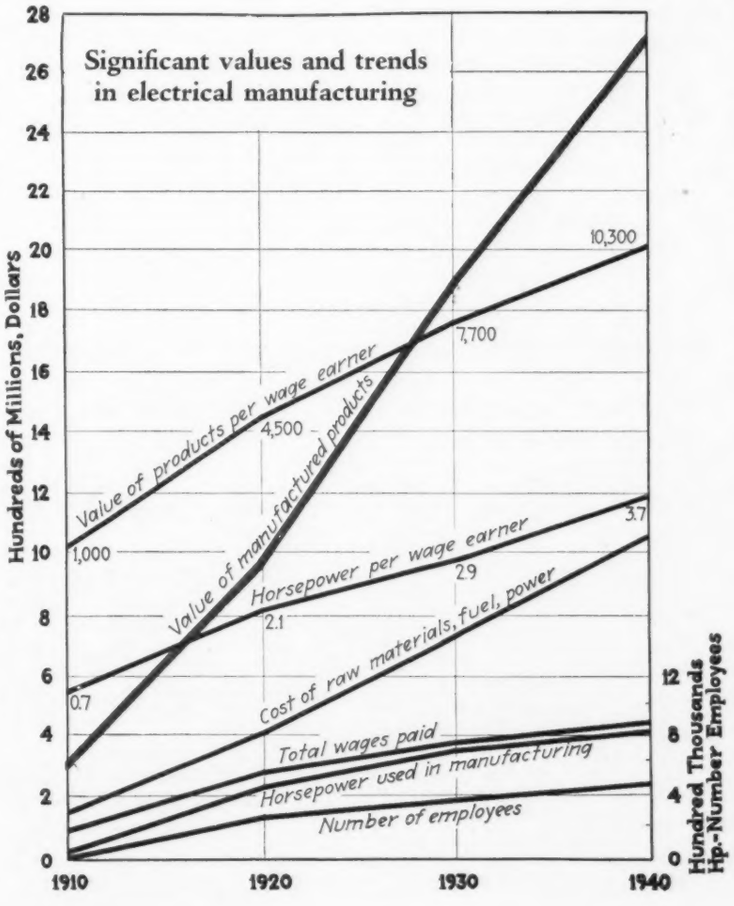
$2,000,000,000 for EQUIPMENT

Manufacturing income about $1,925,000,000 in 1930
Prospects bright for next decade
Unit values show efficiency of operation

BUSINESS in 1930 for electrical manufacturers was about the same as in 1928 and approximately 10 per cent less than the abnormal year of 1929. The 1930 volume was about equal to the normal trend curve for business to be expected over a five-year period. The value of products, based on prices at the factory, may be estimated as $1,925,000,000 for 1930, and this is the order of $2,250,000,000 when based on prices to the ultimate consumer. These estimates, however, cover only the strictly classified group of electrical manufacturers in the U. S. Census and neglect the many products made to go with electrical equipment only and even certain electrical divisions such as electroplating and fixtures.

A good business in 1929 on top of previous good business years enabled electrical manufacturers to face the depression in 1930 with ample resources to weather the storm. During the first six months business continued very good and only during the last half of 1930 was there a steady fall in business. This low point promises to continue, but by July 1 many executives believe business will be in normal stride and there is every reason to believe that 1931 will at least equal the business volume of 1930.

Power equipment, radio apparatus, wiring supplies and small household appliances suffered the greatest decrease in volume in 1930 as compared with 1929. Utility purchases fell below expectations largely in power distribution equipment because of small load increases. Generating apparatus and transmission equipment was in steady volume; the slackening in the building industry was reflected in decreased purchases of wiring supplies, and a disorganized period in the radio industry affected radio sales seriously. On the other hand, aggressive selling increased the sales volume of ranges, water heaters and heavy consumption household devices. Lighting for sports and for commercial and industrial establishments was pushed aggressively; electric refrigerators were sold in increased volume, and a normal volume of sales in standard lines offset much of the decrease and gave the electrical manufacturers a fairly good volume of business as compared to other industries.



What 1931 holds in store for the manufacturers is anybody's guess. The general business condition will reflect itself, but in general there is every reason to believe that business will be slow for the first quarter and then gradually pick up to good volume as the year elapses. Plans are under way for aggressive merchandising to

Table I—Growth in Electrical Manufacturing

(U. S. Census)

Year	Number of Companies	Number of Employees	Wages	Cost of Raw Materials	Value of Products	Value Added by Manufacture	Horsepower Used
1914	1,030	262,000	$109,000,000	$154,000,100	$335,000,000	$180,442,000	226,000
1919	1,404	212,374	238,188,852	425,000,000	997,968,119	572,869,908	438,000
1921	1,333	161,204	194,242,347	344,069,963	833,985,443	489,915,480	.....
1923	1,671	234,892	305,455,263	548,626,673	1,293,001,771	744,375,098	480,268
1925	1,739	339,921	323,834,541	636,692,076	1,540,307,035	903,309,965	589,398
1927	1,777	241,566	336,238,750	745,761,699	1,637,307,035	991,545,336	661,168
1929	1,798	329,361	455,294,638	921,190,963	2,286,273,042	1,365,082,079	.....

Table II—Classified Electrical Equipment Growth

(Value of Products in Dollars—U. S. Census)

	1914	1919	1921	1923	1925	1927	1929
Generators, motor-generators, etc.	17,865,542	86,266,114	65,172,221	106,376,674	110,185,015	104,246,026	68,131,815
Household appliances	.....	.....	37,670,836	63,914,840	75,102,165	77,519,218	76,890,453
Insulated wire and cable	69,505,573	128,682,339	98,332,970	184,472,095	210,617,310	210,047,947	296,858,831
Incandescent lamps	17,350,385	57,646,900	59,728,398	71,966,225	73,558,210	87,933,244	85,319,515
Motors and parts	44,176,255	116,893,638	74,446,738	109,188,685	113,109,577	111,819,855	185,233,201
Radio apparatus	792,465	8,074,636	10,647,617	54,000,470	178,834,697	198,436,434	342,056,730
Switchboards and gear	15,382,662	26,327,837	36,298,897	57,856,166	69,759,067	71,924,341	79,424,219
Telephone apparatus	22,815,640	46,214,342	101,882,354	93,398,031	81,510,499	115,451,822	.....
Transformers	14,513,831	27,060,624	42,103,028	59,114,722	62,153,155	66,266,216	78,114,532
Wiring devices	7,580,000	26,919,178	21,806,416	34,966,232	34,806,452	32,703,331	43,120,093

households, utilities expect to spend a normal budget, building is expected to come back, radio manufacturers expect to better conditions in that branch of the industry, jobber and dealer supplies are low and stocks of manufacturers are low. No serious handicap to business expansion exists and a revival of general business will find electrical manufacturing ready and quickly responsive.

Radio manufacturers have enjoyed a fair year, although the advent of the "midget set" has seriously affected dollar value of output. Sales of these small sets in October were 25 per cent of total sales. They rose to 50 per cent in November and may reach 60 per cent for the rest of the 1930-31 season. Looking ahead, leading radio executives declare that saturation is now so far advanced that future annual sales will be 25 per cent or more reduced, predicting a drop of 1,000,000 sets or more from recent totals. On the other hand, if the Federal Radio Commission grants the high power broadcasting applications now before it, thus extending radio service to hundreds of communities not now adequately served, the now probable total of 2,000,000 sets to be sold next year will be increased to at least 4,000,000.

What the trend indicates

In the decade from 1910 to 1920 the value of manufactured electrical products, at factory prices, based on U. S. Census estimates, increased from $240,000,000 in 1910 to $960,000,000 in 1920, an average increase of about 30 per cent each year. In the next decade the corresponding values were $960,000,000 in 1920 and $1,925,000,000 in 1930, an average increase of about 10 per cent each year. In 1940 it is estimated the value of manu-

Earnings of Electrical Manufacturers Rise Steadily

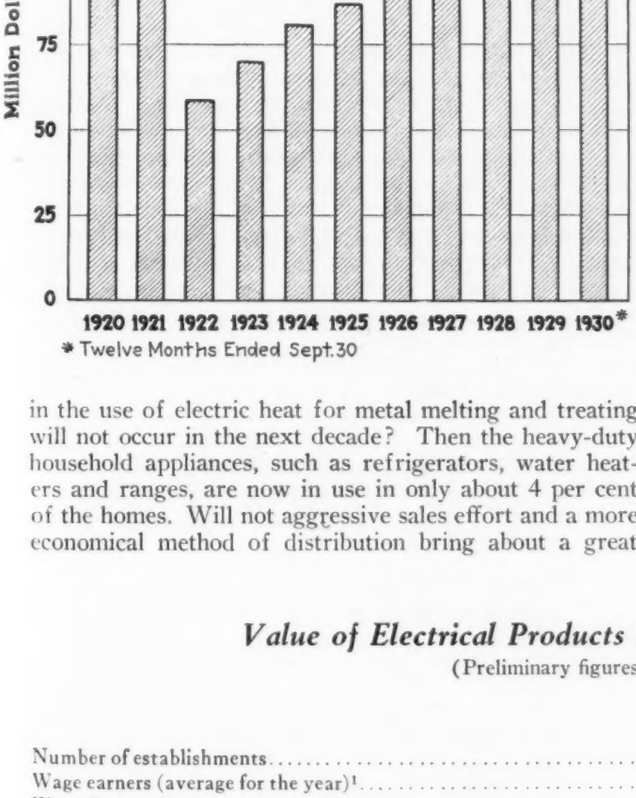
	Gross Sales				Earnings per Share			
	1926	1927	1928	1929	1926	1927	1928	1929
Allis-Chalmers Manufacturing Company...	$30,682,543	$33,352,252	$36,294,562	$45,302,355	$9.39	$10.02	$11.28	*$3.78
American Brown Boveri Electric Corporation[3]	896,024	578,944	1,187,017	747,277	.....	.....	.....	.....
Century Electric Company[2]	1,321,138	1,107,159	910,209	921,058	17.72	13.73	10.87	11.08
Crocker-Wheeler Electric Manufacturing Company[2]	298,281	194,543	170,911	508,597	5.01	2.01	1.08	1.23
Cutler-Hammer Manufacturing Company.	10,546,279	9,345,156	9,340,749	12,368,340	6.87	5.20	5.24	9.77
Electric Storage Battery Company.....	54,199,150	45,640,291	46,219,193	48,412,420	7.31	7.09	7.82	8.78
General Electric Company.....	326,974,104	312,603,772	337,189,422	415,338,094	6.14	6.41	7.15	8.97
Kelvinator Corporation[1].....	17,163,128	20,122,865	18,120,602	21,947,344	4.34	.....	.....	1.03
Maytag Company[1].....	28,722,041	25,582,684	22,527,306	25,625,557	3.29	2.87	2.85	3.33
Ohio Brass Company[2].....	2,501,657	2,506,455	2,002,058	2,823,057	8.26	6.90	5.42	7.78
Otis Elevator Company[2].....	5,505,400	7,057,641	7,614,106	7,855,491	13.59	13.44	16.09	16.56
Radio Corporation of America.....	56,093,505	56,651,658	86,900,153	.....	2.85	6.15	15.98	1.58
Sangamo Electric Company[1].....	3,226,263	3,103,934	2,927,166	3,545,150	.....	3.23	1.61	4.12
Wagner Electric Company[2].....	1,294,773	1,561,169	3,067,988	3,781,976	.....	2.99	3.00	4.61
Western Electric Company.....	263,105,194	253,724,013	287,931,396	410,949,817	19.43	4.63	4.93	5.14
Westinghouse Electric & Manufacturing Company[3].....	166,006,800	185,543,087	175,456,815	216,364,588	6.03	6.91	8.95	10.33
Weston Electrical Instrument Corporation[2].	775,634	573,750	802,816	1,216,433	2.40	1.77	2.51	4.49

[1] Net sales. [2] Net profits. [3] Gross income. [4] Sales billed. [5] Based on $100 par. *Based on four for one split.

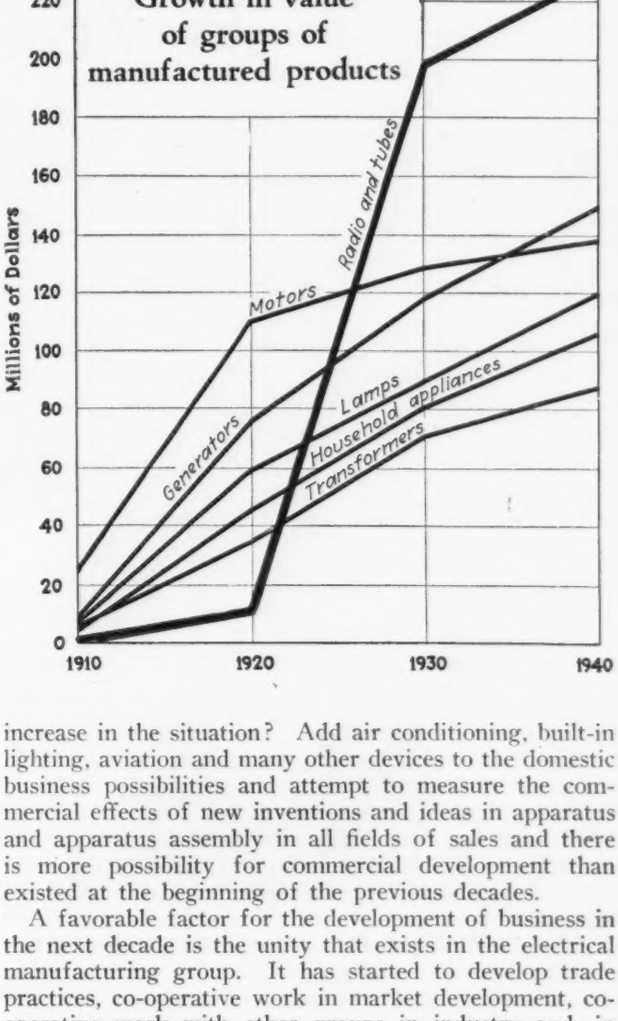
factured products will be at least $2,780,000,000, an average yearly increase of about 4.6 per cent, which is the long trend increase of general business in the country and thus is very conservative.

Sources of past growth

The increases in past decades were the result of two factors—the normal growth and expansion of the business and the commercialization of new products and devices that came from inventions and discoveries. One of the features of the last type of development was the growth of radio from about $10,000,000 in 1920 to $230,000,000 in 1930. There is every reason to expect a corresponding development in the next decade. The motorization of industry period, for example, was from 1910 to 1920, and who can say that an equally rapid expansion



in the use of electric heat for metal melting and treating will not occur in the next decade? Then the heavy-duty household appliances, such as refrigerators, water heaters and ranges, are now in use in only about 4 per cent of the homes. Will not aggressive sales effort and a more economical method of distribution bring about a great



increase in the situation? Add air conditioning, built-in lighting, aviation and many other devices to the domestic business possibilities and attempt to measure the commercial effects of new inventions and ideas in apparatus and apparatus assembly in all fields of sales and there is more possibility for commercial development than existed at the beginning of the previous decades.

A favorable factor for the development of business in the next decade is the unity that exists in the electrical manufacturing group. It has started to develop trade practices, co-operative work in market development, co-operative work with other groups in industry and, in addition, is doing much to make better and more effective its channels of distribution and sale. The credit position is good, the programs for expansion well thought out and there is every reason to predict a successful decade of business for the manufacturers.

Value of Electrical Products Rose 40 per Cent in Two Years

(Preliminary figures, Bureau of the Census)

	1929	1927	Per Cent of Increase or Decrease
Number of establishments	1,798	1,777	1.2
Wage earners (average for the year)[1]	329,361	241,566	36.3
Wages[2]	$455,294,638	$336,238,750	35.4
Cost of materials, containers for products, fuel, and purchased electric current[2]	$921,190,963	$745,761,699	42.7
Products, total value[2]	$2,286,273,042	$1,637,307,035	39.6
Electrical machinery, apparatus and supplies	$2,217,634,994	$1,551,816,138	32.8
Other products, not normally belonging to the industry and receipts for repairing	$68,638,048	$85,490,897	....
Value added by manufacture:			
Total	$1,365,082,079	$991,545,336	37.7

[1]Not including salaried employees.

[2]Manufacturers' profits cannot be calculated from the census figures because no data are collected for certain expense items, such as interest on investment, rent, depreciation, taxes, insurance and advertising.

A Year of Accomplishment

WHILE the telephone industry has felt the effects of the severe business depression, particularly in that growth has been much less than it would have been under normal conditions, nevertheless there has been a small increase during 1930 in telephones and in the volume of telephone conversations.

In addition, the new types of service, such as trans-oceanic and ship-to-shore, have been extended. There has also been steady improvement in the telephone plant and service due to improved maintenance and operation and to the introduction of new developments.

Dial telephone for intercommunicating systems

Push buttons serve to establish connections

Construction has been maintained at a high level during the present depression and plant has been built in advance of requirements. This has been done primarily to maintain employment for the construction and manufacturing forces, but it is also true that plant can be built economically at the present time.

Not including manufacturing facilities, the Bell system construction program—i.e., gross expenditures for additions, betterments and replacements for each of the last five years—is as follows:

1926	$382,750,000
1927	377,104,000
1928	428,778,000
1929	588,022,000
1930 (partly estimated)	600,000,000

Conversations, Stockholders and Dial Phones Increase.—For the year ended September 30, 1930, it is estimated that completed telephone conversations averaged nearly 83,000,000 a day, as compared with about 81,000,000 for the same period a year ago. This figure includes toll and long-distance conversations, averaging 3,530,000 a day, an increase of 170,000 over the daily average of 3,360,000 during the corresponding period of 1929.

It is interesting to note that telephone securities are continuing to prove very attractive to investors. As an example, there were on September 30, 1930, about 570,000 holders of common stocks of the Bell system as compared with about 480,000 holders of such securities a year before.

The extension of dial telephone service is continuing with an estimated increase in the United States during 1930 of about 1,000,000 stations, bringing the total dial telephones in the United States to approximately 5,250,000, or more than one-quarter of the total number of stations in this country. For the Bell companies it is expected that the conversion to the new system, in all places for which it is suitable, will be completed within eight or ten years.

An interesting addition to facilities and equipment to provide complete and convenient telephone service is a new type of private branch exchange standardized by the Bell system during the year. This is a dial intercommunicating system suitable for the larger residences and apartments and for business offices of moderate size. No operator or attendant is required to answer incoming calls, since this can be done by push buttons at any of the telephones. Likewise, outgoing calls are established without the aid of an attendant. Intercommunicating calls are made by means of the dial. Incoming calls answered at any telephone may be transferred to any other telephone of the system. Complete privacy for both outside and intercommunicating connections is provided. This new equipment is available in two sizes, the larger with a capacity of fifteen telephones and three outside lines, and the smaller with eight telephones and two outside lines.

Daily conversations reach 83,000,000

Stockholders increased 19 per cent to 570,000.

Adds 1,000,000 dial telephones, making 5,250,000.

New dial intercommunicating telephone.

Automatic call repeater installed by three cities.

10 per cent of telephones—hand type.

67 per cent of toll circuit in stormproof cable.

Toll rates reduced; clarity and speed increased.

160,000 channel-miles of carrier telephone added.

in the Telephone Field

Short-wave transmitting station at Lawrenceville, N. J.; connecting with Buenos Aires and London and thence with Chile, Uruguay, Europe and Australia.

A development of interest in connection with tandem equipment of the panel type for such cities as New York, Chicago and Boston is a new call announcer which speaks the number to the manual operators. This employs the same general principles of sound recording and reproduction by film as were devised for talking motion pictures. The machine consists of fourteen individual speech channels, corresponding to the ten digits and four-party letters, which give a constant repetition of each numeral or letter with a silent interval. Connection is made automatically and in succession with the proper speech channels to make up the number wanted. The switching from one channel to the next takes place in the silent interval. It is expected that this machine will facilitate extension of the tandem method to the more distant manual suburban offices.

Circuits connecting 200 broadcasting stations transmit 50 to 8,000 cycles.

Telephone typewriter system adopted by three states and four cities.

Joint committee of power and telephone companies submits report—railroads and telephone companies getting together.

International and ship-to-shore communication greatly extended.

Two-way television demonstrated, but not commercial.

Sells $258,000,000 in stock at par in 1930.

United States and San Francisco lead in telephones per capita.

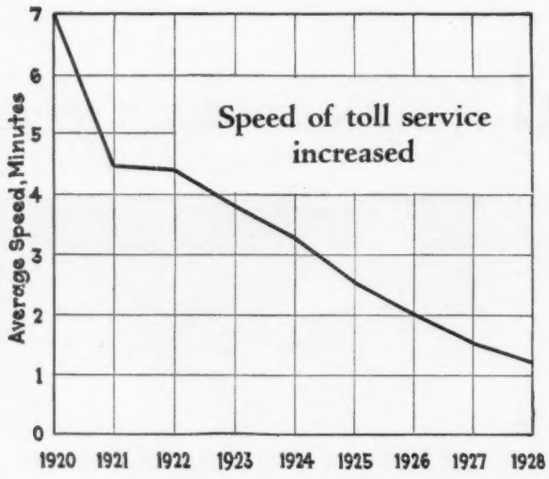
The hand telephone set, introduced several years ago, continues to be popular with the telephone-using public and hence appears to meet its ideas of a convenient form of telephone. On September 30, 1930, there were in service in the Bell system approximately 1,560,000 hand sets, which is about 10 per cent of the total number of subscribers' stations.

Toll Rates, Clarity, Speed and Reliability.—The toll plant of the Bell system in the United States, which provides long-distance connections not only for the Bell-owned companies but for independently owned companies connecting with the Bell system, has continued its rapid growth during the year 1930. It is estimated that during the year there were added to the cable network about 4,300 miles of loaded intercity cables provided with telephone repeaters and about 1,300 miles of cable for short-haul purposes, making a cumulative total of both types for the United States of more than 25,000 miles, as compared with 20,000 miles a year ago.

The large proportion of toll wire in stormproof cable is indicated by the fact that of more than 8,500,000 circuit-miles of toll wire in the plant it is estimated that at the end of 1930 approximately 5,750,000 were in cable. The proportion in toll cable will be constantly increasing during the immediately following years. The extension of the toll cable program over the next five-year period contemplates cable on a large proportion of all the major toll routes of the country.

In addition to the effect of substantial rate reductions over the past few years the growth in the toll service of this country has undoubtedly been stimulated by improvements in the quality of the service given. One important improvement in this respect over the past few years has been the increase in the speed of service—that is, the decrease in time which elapses between placing of a call and its completion. A curve showing the successive improvements in decreasing this time is shown.

Another very important advance in the toll service has come from improvements in the design of circuits, resulting in greater distinctness of messages and more



naturalness of tone. This has included the use of methods providing for the efficient transmission of a larger portion of the component frequencies which make up speech. The history of transmission over long-distance circuits has been one of continually improved standards in this respect. Telephony involves the transmission of a "band" of frequencies and the naturalness of the received voice is largely dependent upon the width of this band. The original loaded transcontinental line which was opened in 1915 gave a band width of only about 900 cycles. Improvements in this circuit brought the band width up to about 1,800 cycles, while the modern carrier telephone circuit is better still, giving well above 2,500 cycles. The standard type of loaded cable circuit gives a band extending even higher. These improvements have substantially decreased the percentage of messages in which the clearness of transmission is judged to be unsatisfactory, this percentage at the present time being about 1 per cent for the total toll board traffic.

In addition to the toll cable program, it is estimated that during the year 1930 approximately 200,000 conductor-miles of open-wire toll facilities were installed, together with about 160,000 channel-miles of carrier telephone facilities. An innovation in this connection has been the introduction in the plant of the Bell system of a new form of open-wire construction which permits using a larger number of long-haul carrier telephone circuits. This new method involves abandoning the phantoms on the open-wire pairs on which carrier facilities are to be superposed, reducing the spacing between the wires of these pairs from 12 in. to 8 in. and widening the space between the wires of adjacent pairs to 16 in.

Recently there has been introduced a new method of providing amplification at intermediate toll switching points, replacing the previous cord circuit repeater method. In accordance with the new plan, terminal repeaters are provided at certain switching points, doing away entirely with cord circuit repeaters at these points. With this arrangement, the insertion of transmission "gain" on switched connections is done automatically by taking out of each circuit a section of artificial line, which is, of course, the equivalent of increasing the "gain" of the terminal repeater. No attention on the part of the toll operator is required. It is expected that the application of this plan will result in improvement of telephone connections where intermediate switching is involved.

Broadcast Wire Network Transmits 50 to 8,000 Cycles.—An important phase of wire-telephone transmission is the connecting together of radio broadcasting stations covering various local areas in the United States so that programs are delivered simultaneously to all of

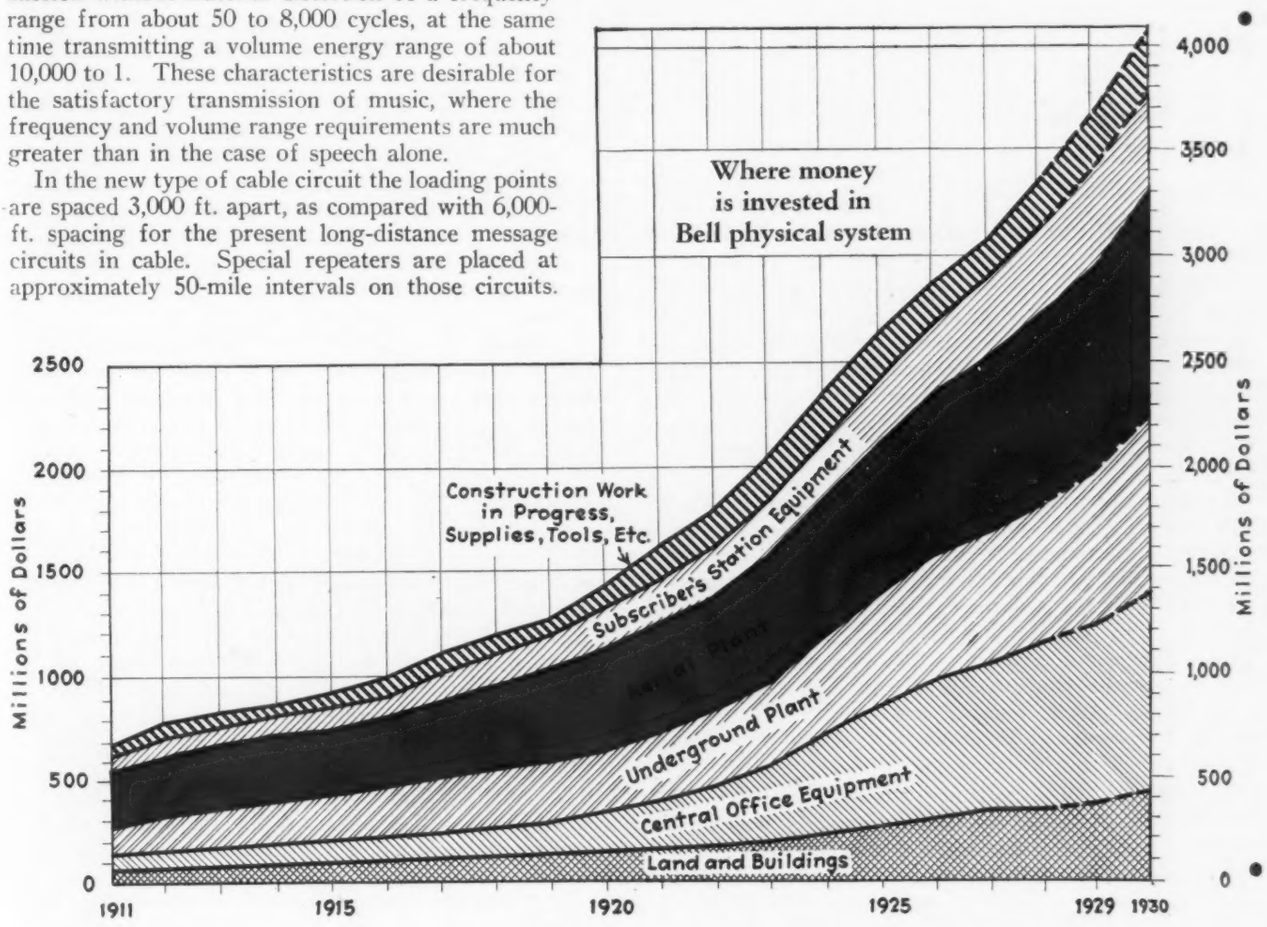
Significant Facts Regarding Bell Telephone System

Number of Telephones	**1910** Dec. 31	**1915** Dec. 31	**1920** Dec. 31	**1925** Dec. 31	**1930** Sept. 30	**Increase Since Sept. 30, 1929**
Bell Companies:						
Manual service	3,933,056	5,968,110	8,176,884	10,538,935	10,963,889	—482,522
Dial service	0	0	157,095	1,496,289	4,711,697	967,587
Total	3,933,056	5,968,110	8,333,979	12,035,224	15,675,586	485,065
Bell connecting companies and lines	1,949,663	3,204,385	4,267,956	4,685,000	4,423,885	—244,760
Total	5,882,719	9,172,495	12,601,935	16,720,224	20,099,471	240,305
Number of connecting companies	7,396	8,735	9,231	9,227	7,249	—701
Number of connecting rural lines	10,449	19,579	26,032	28,861	29,719	—741
Number of central offices	4,933	5,300	5,702	6,017	6,576	250
Miles of pole lines	282,877	330,602	358,091	386,064	421,808	13,354
Miles of Exchange Wire						
Underground cable	5,630,851	9,947,359	14,384,135	28,425,392	43,925,343	3,619,963
Aerial cable	2,800,000	4,503,124	5,586,531	9,462,213	16,040,504	1,436,697
Open wire	1,247,367	1,601,579	1,633,802	1,953,235	2,205,322	94,429
Total exchange wire	9,678,218	16,052,062	21,604,468	39,840,840	62,171,169	5,151,089
Miles of Toll Wire						
Underground cable	386,088	625,792	1,363,398	2,057,196	5,424,476	1,528,123
Aerial cable	70,000	98,804	299,385	1,209,332	4,351,182	865,530
Open wire	1,507,906	1,728,887	2,110,153	2,366,172	3,030,485	263,486
Total toll wire	1,963,994	2,453,483	3,772,936	5,632,700	12,806,143	2,657,139
Total miles of wire	11,642,212	18,505,545	25,377,404	45,473,540	74,977,312	7,808,228
Average Daily Telephone Conversations						
Exchange	21,681,471	25,183,799	31,835,353	46,702,307	*61,515,000	2,480,000
Toll	602,539	819,030	1,327,247	2,098,163	3,165,000	185,000
Total	22,284,010	26,002,829	33,162,600	48,800,470	64,680,000	2,665,000

*For year ended September 30.

them. About 35,000 miles of telephone circuits are now being regularly utilized for this service and almost 200 radio broadcasting stations receive programs from one or more of the chains of wire circuits. Heretofore practically all of this service has been furnished by means of open wires using voice-frequency channels. Due to the fact that long-distance cables are supplementing the open-wire routes, particularly those carrying heavy traffic, the advantages of placing some program transmission circuits in cables have led to the development of cable transmission circuits having the special characteristics necessary for this type of service. New cable circuits have recently been developed which permit of transmission without material distortion of a frequency range from about 50 to 8,000 cycles, at the same time transmitting a volume energy range of about 10,000 to 1. These characteristics are desirable for the satisfactory transmission of music, where the frequency and volume range requirements are much greater than in the case of speech alone.

In the new type of cable circuit the loading points are spaced 3,000 ft. apart, as compared with 6,000-ft. spacing for the present long-distance message circuits in cable. Special repeaters are placed at approximately 50-mile intervals on those circuits.



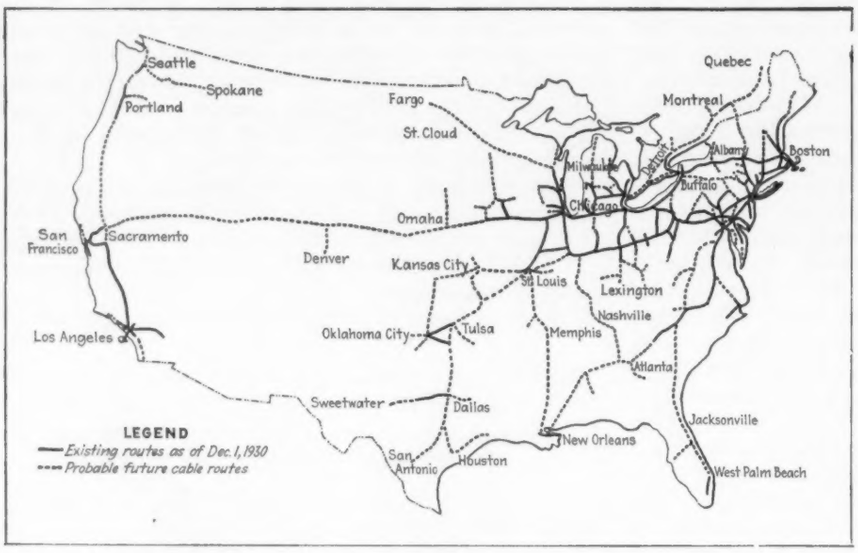
Associated with each repeater is an attenuation equalizer and a delay equalizer. These equalizers correct for the attenuation and delay differences at different frequencies introduced by the cable section preceding each repeater. The program pairs in the cable are of 16-gage wire and are spaced so as to minimize interference internal to the cable.

Telephone Typewriter Adopted by States and Cities.—A new state-wide telephone typewriter system has been installed during the year in New Jersey for the New Jersey State Police. The headquarters of this network is at Trenton and there are about 30 stations located throughout the state. In addition to state-wide telephone typewriter systems in Connecticut and Pennsylvania, there is an increasing number of large city police networks—New York City, Boston, Buffalo and St. Louis.

Co-operation Between Wire-Using Companies.—Many problems arise in co-ordinating power and telephone lines, since they serve the same public and often traverse the same highways. One of the many important accomplishments of the joint general committee of the National Electric Light Association and the Bell Telephone System has been the publication during 1930 of Vol. I of its engineering report on development and research. The investigations of this committee have already found application in a number of field problems and the reports, it is expected, will be of general interest to power and telephone companies.

During the past year tentative plans were made for the formation of a joint general committee of the American Railway Association and the Bell system. Such a committee would provide machinery for working out principles and practices which are suitable for the co-operative handling of mutual problems and should, therefore, be very helpful in connection with co-operative work between the railroads and the telephone companies.

Foreign Telephone Connections Extended.—The year 1930 has witnessed considerable extension of the foreign telephone connections available to any subscriber in the United States. In April telephone service was opened from North America to South America. The link between the continents is a short-wave circuit connecting the overseas radio stations of the American Telephone & Telegraph Company in the United States with the



Main toll cable routes of U. S. and Canada

International Telephone & Telegraph Corporation's stations in the vicinity of Buenos Aires. The connections in South America include the Argentine Republic and the cities of Santiago, Chile, and Montevideo, Uruguay. Plans are under way for the extension of transoceanic telephone service in the Pacific region, it being expected that service to Hawaii will be the first step in this program.

During the year a second telephone network in Mexico was made available for international connections, when service was extended to the stations of the Ericsson Telephone Company in that country. This system covers some forty cities and towns in the eastern section of Mexico from the Rio Grande to the vicinity of Mexico City. Service in Sweden, which has previously been limited to Stockholm, Göttenborg and Malmö, was extended to all telephones in that country. The service was also extended to the State of Vatican City, and to Memel and Kovno in Lithuania.

During the latter part of October, 1930, telephone service was opened to Australia. The circuit employed outside of the North American continent consists of two radio links, one across the Atlantic and the other between England and Australia. The New York-Sydney (Australia) circuit is more than 14,000 miles long.

To take care of the growing telephone traffic between the United States and Cuba, arrangements have been made to provide a new cable to supplement the three telephone cables placed in operation in 1921. The new cable will be non-loaded, while the older cables were of the continuously loaded type. It will be insulated with the new "paragutta," developed after extensive research in the Bell Telephone Laboratories. The new cable will be capable of transmitting a range of frequencies up to about 30,000 cycles and it is planned to employ telephone carrier-current methods which will provide three telephone circuits on the single-conductor cable, the same number as is provided by the three cables of the older type.

Ship-to-Shore Service Expanded.—This service, which was inaugurated during the latter part of 1929 with the S.S. *Leviathan,* was extended during 1930 to the S.S. *Majestic, Olympic, Homeric* and *Belgenland.* Service from ships to England is also available through stations of the British Post Office. While these ships are in range of the American transmitting and receiving stations during their crossings, telephone service is available to all points in the United States and Cuba and to the principal cities in Canada and Mexico through connection with the land telephone lines. A new short-wave transmitting station for this service is being installed at Ocean Gate, N. J. This new station will have four antennas of the "curtain" type, consisting of networks of wires in the form of coarse mesh curtains suspended from 70-ft. poles placed in a line broadside to the direction of transmission and having a marked directional effect, covering the principal European steamship lanes.

Television Demonstrated, but Not Commercial.—In April the American Telephone & Telegraph Company demonstrated a system of two-way television which can supplement the usual two-way oral communication, permitting the parties to a conversation to see as well as hear each other. Since the initial demonstration by the Bell system in 1927 of television over wire lines and by radio, considerable improvement has been made toward simplification and efficiency. The system is still, however, inherently complicated and expensive and because of this no commercial field is yet in sight.

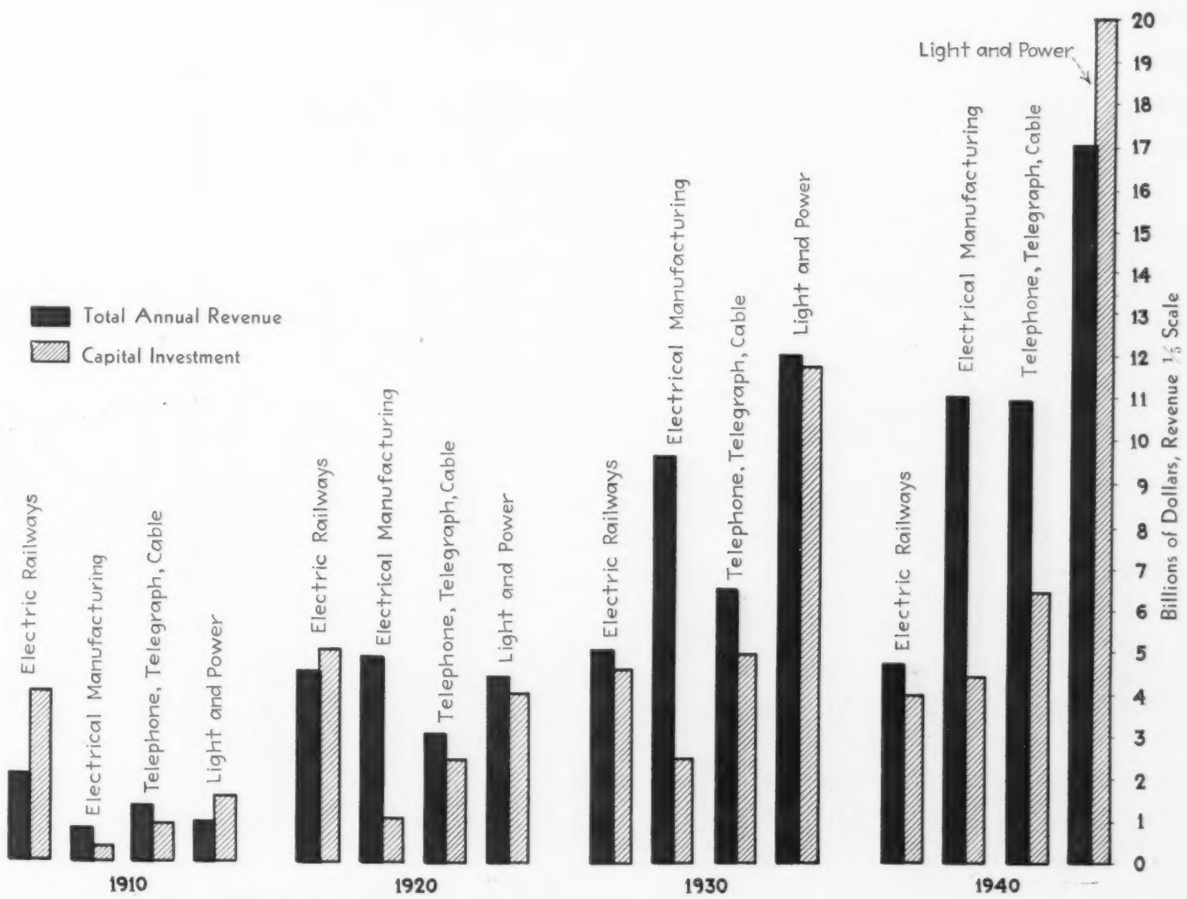
Sells $258,000,000 in Stock in 1930.—In view of the general recession in business, the experience of the American Telephone & Telegraph Company in its stock offer of 1930 is interesting. The amount of stock offered was $257,940,700 at par, and rights to subscribe to this stock were issued to 508,764 stockholders. The success of the offer is indicated by the fact that less than one-fifth of 1 per cent of the shares offered were not subscribed—a smaller ratio than for any similar stock issue of the company. Stockholders were invited to use the local facilities provided through Bell telephone business offices and efforts were made throughout the country to reach those stockholders who were thought most likely to need assistance in taking advantage of their rights. The subscriptions received numbered over 283,000, some 18,000 more than in the 1928 issue. There was an increase in the average number of shares per subscription from 7.0 in 1928 to 9.1 in 1930.

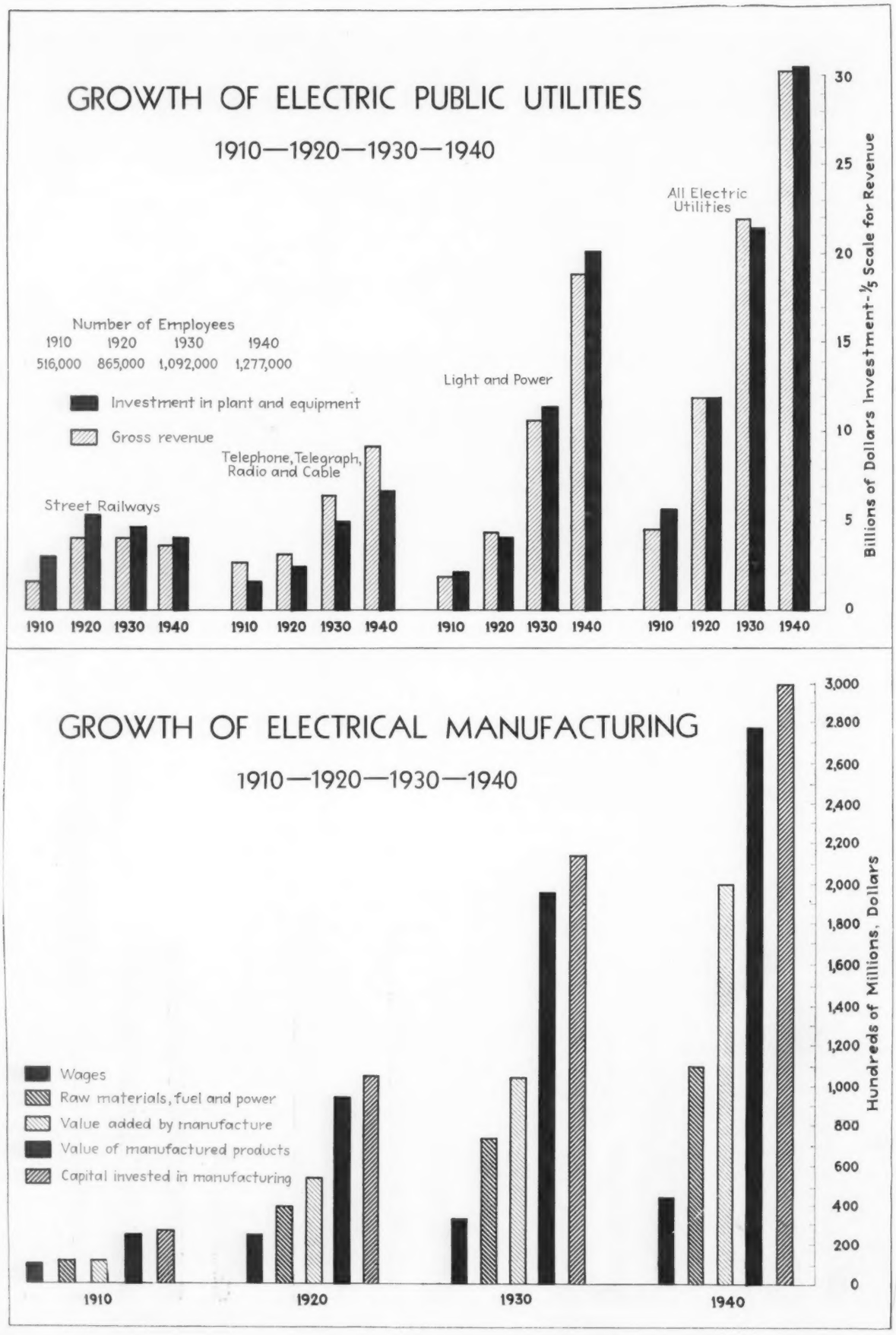
United States and San Francisco Lead in Telephones per Capita.—A survey of the world's telephone statistics published during the past year shows the United States continuing to lead in telephone development, with 16.3 telephones per 100 population. Canada, with 13.7 telephones per 100 inhabitants, was second, and New Zealand third, with 10.2. San Francisco heads the list of large cities of the world in telephone development, with 33.6 telephones per 100 population. Stockholm is second, with a development of 29.8, and Washington, D. C., third, with 29.3 per 100 population.

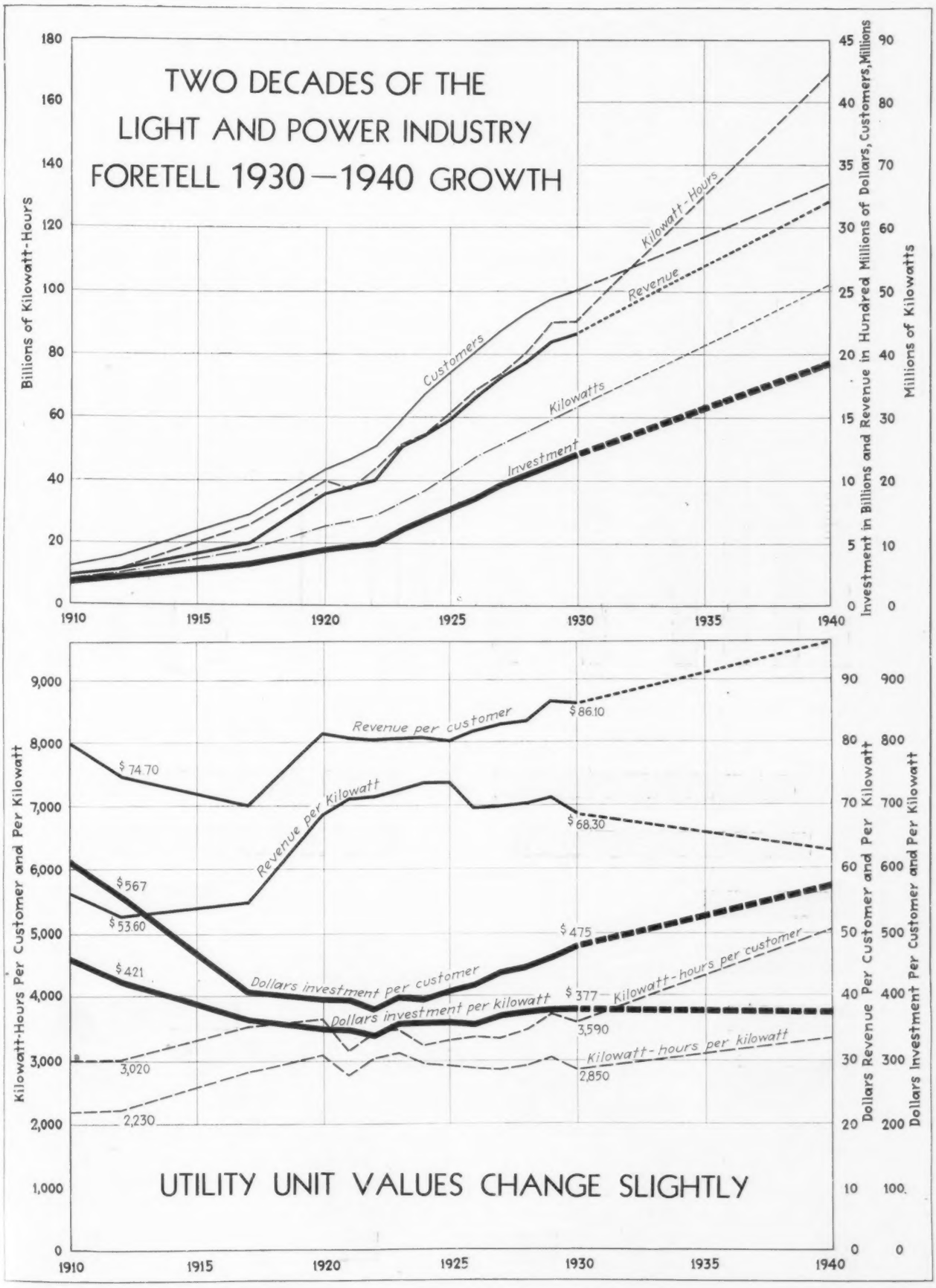
THREE DECADES OF PROGRESS

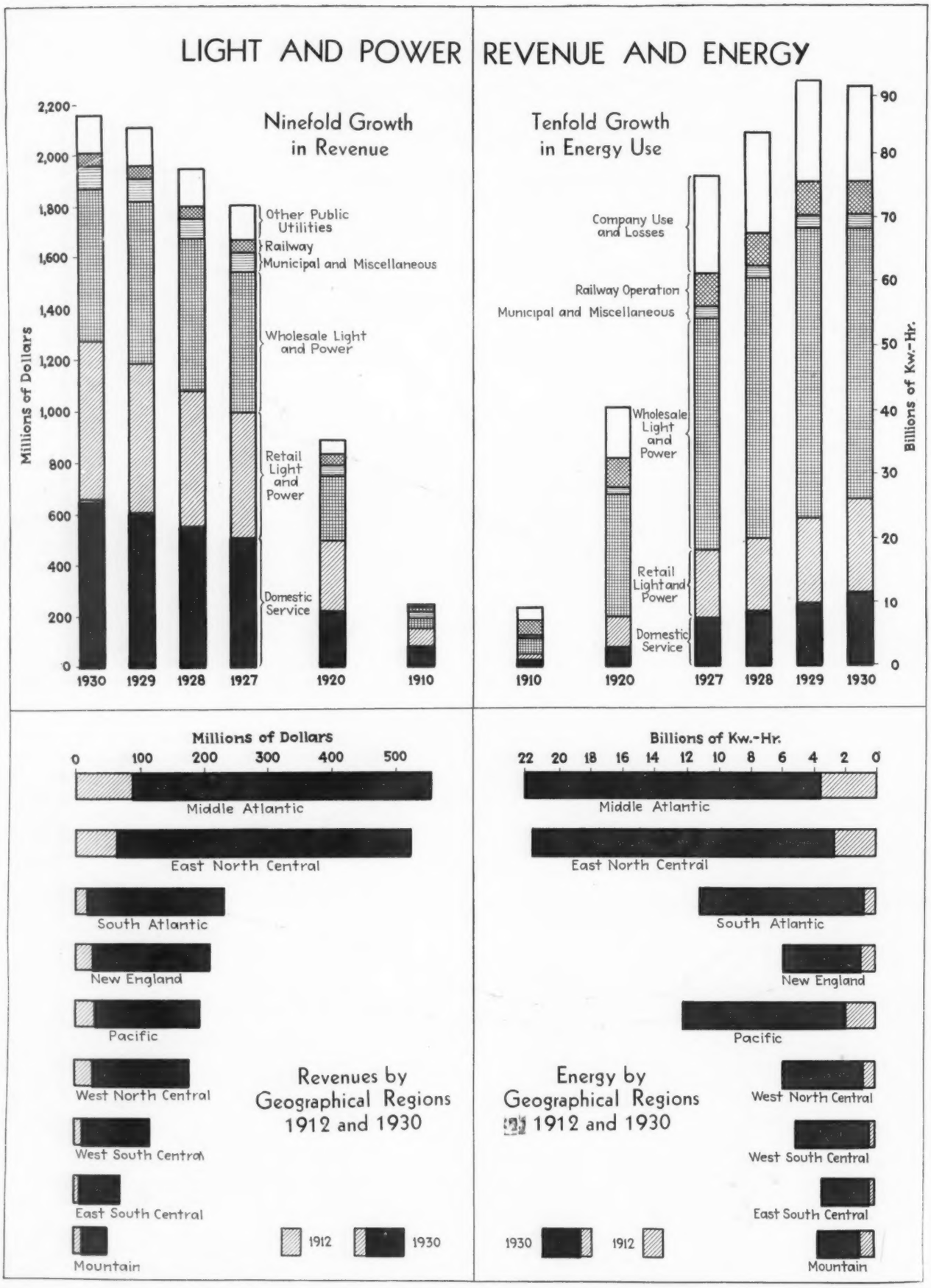
1910 1920 1930 1940

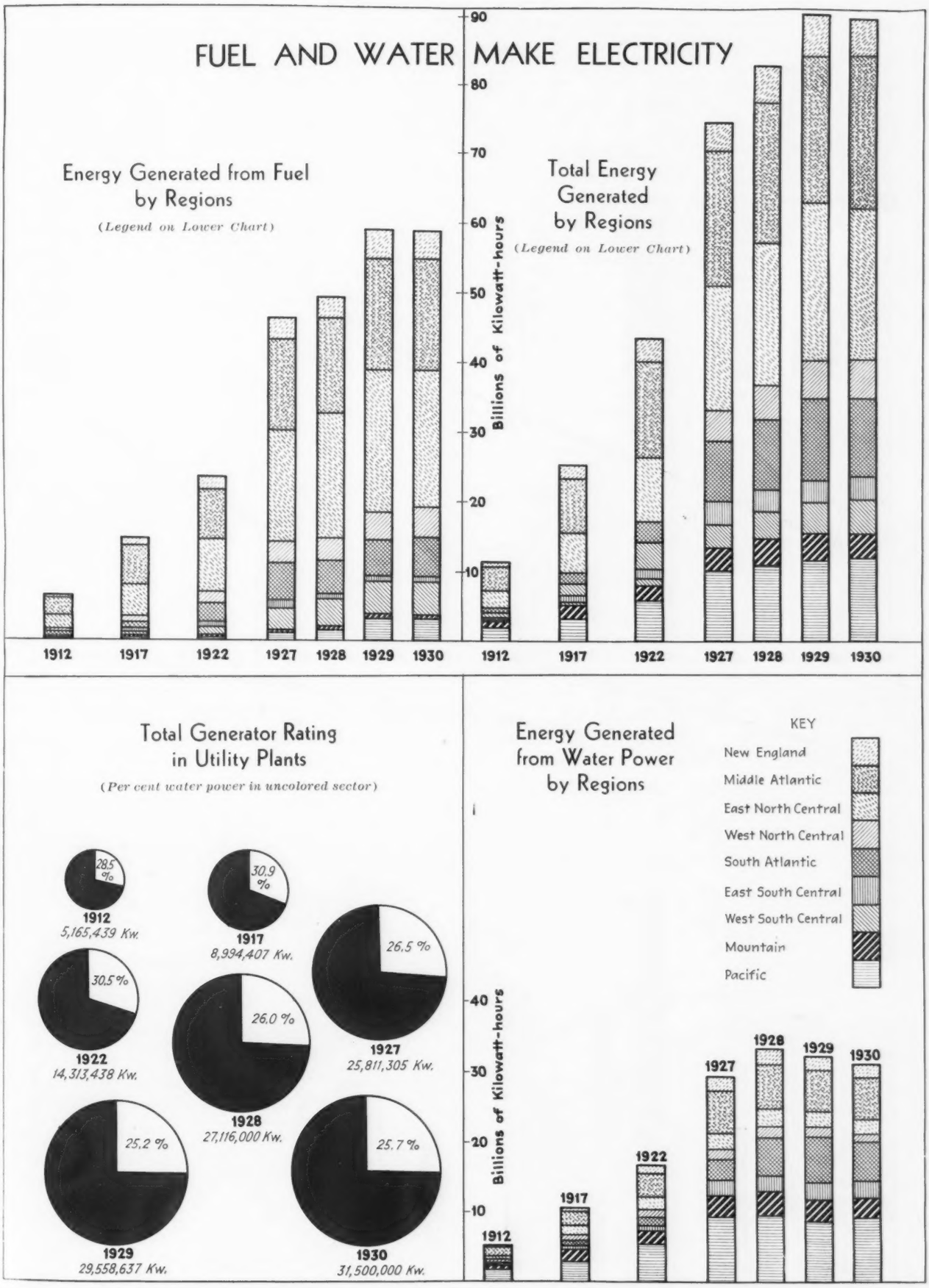
STATISTICAL SURVEY OF ELECTRIC UTILITIES AND MANUFACTURERS WITH ESTIMATES OF GROWTH IN BUSINESS TO 1940

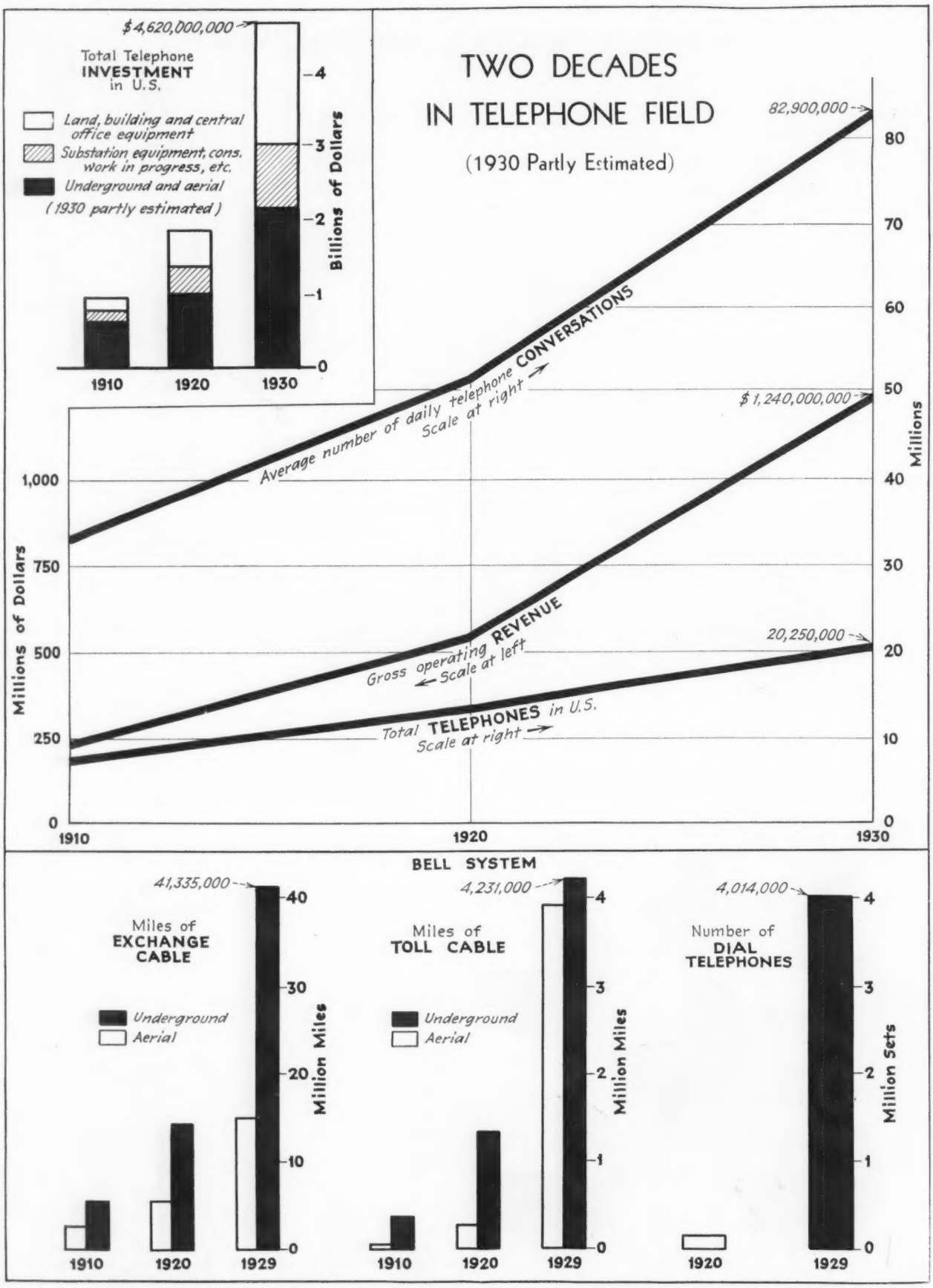


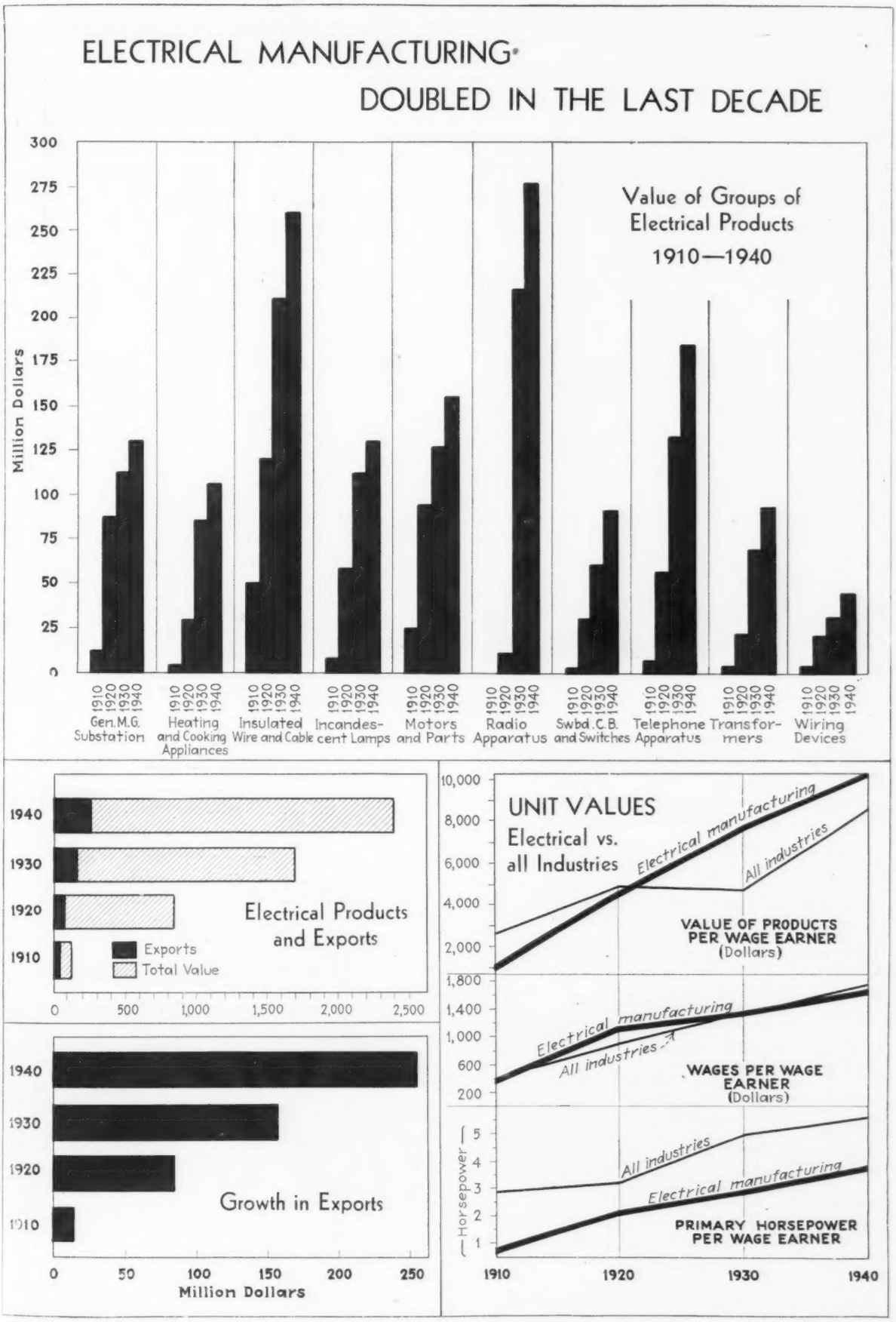

GROWTH OF ELECTRIC PUBLIC UTILITIES
1910—1920—1930—1940
Number of Employees
1910 1920 1930 1940
516,000 865,000 1,092,000 1,277,000
Investment in plant and equipment
Gross revenue
Street Railways
Telephone, Telegraph, Radio and Cable
Light and Power
All Electric Utilities
Billions of Dollars Investment-⅕ Scale for Revenue
0 5 10 15 20 25 30
1910 1920 1930 1940
GROWTH OF ELECTRICAL MANUFACTURING
1910—1920—1930—1940
Wages
Raw materials, fuel and power
Value added by manufacture
Value of manufactured products
Capital invested in manufacturing
Hundreds of Millions, Dollars
0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000 2,200 2,400 2,600 2,800 3,000
1910 1920 1930 1940

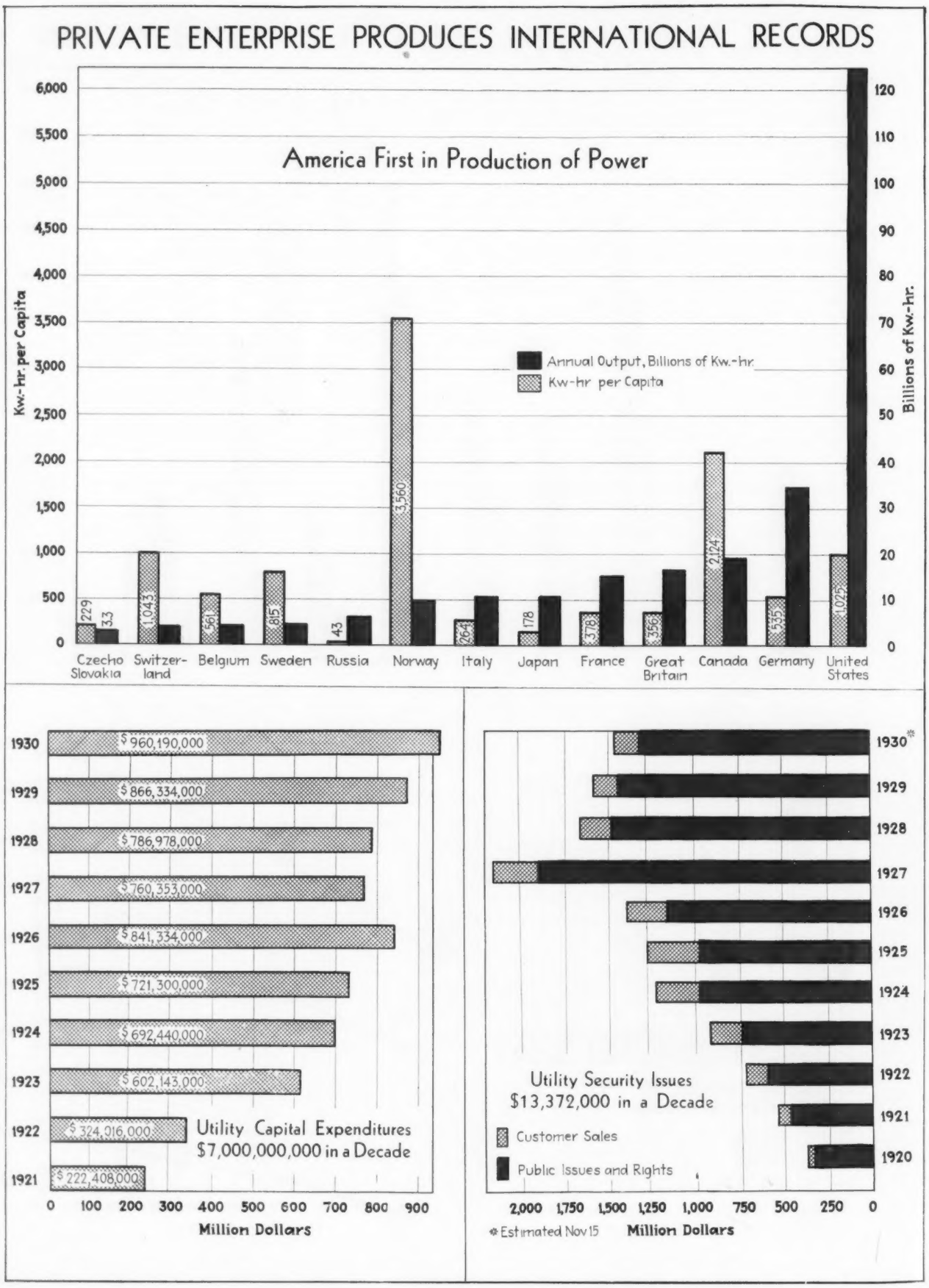

TWO DECADES OF THE
LIGHT AND POWER INDUSTRY
FORETELL 1930—1940 GROWTH
Billions of Kilowatt-Hours
Investment in Billions and Revenue in Hundred Millions of Dollars, Customers, Millions
Millions of Kilowatts
Kilowatt-Hours
Revenue
Customers
Kilowatts
Investment
180
160
140
120
100
80
60
40
20
0
45
40
35
30
25
20
15
10
5
0
90
80
70
60
50
40
30
20
10
0
1910
1915
1920
1925
1930
1935
1940
Kilowatt-Hours Per Customer and Per Kilowatt
Dollars Revenue Per Customer and Per Kilowatt
Dollars Investment Per Customer and Per Kilowatt
Revenue per customer
$86.10
$74.70
Revenue per Kilowatt
$68.30
$567
$53.60
$475
$421
Dollars investment per customer
$377
Kilowatt-hours per customer
Dollars investment per kilowatt
3,590
Kilowatt-hours per kilowatt
3,020
2,850
2,230
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
90
80
70
60
50
40
30
20
10
0
900
800
700
600
500
400
300
200
100
0
1910
1915
1920
1925
1930
1935
1940
UTILITY UNIT VALUES CHANGE SLIGHTLY


LIGHT AND POWER REVENUE AND ENERGY
Ninefold Growth in Revenue
Tenfold Growth in Energy Use
Millions of Dollars
Billions of Kw.-Hr.
Other Public Utilities
Railway
Municipal and Miscellaneous
Wholesale Light and Power
Retail Light and Power
Domestic Service
Company Use and Losses
Railway Operation
Municipal and Miscellaneous
Wholesale Light and Power
Retail Light and Power
Domestic Service
1930 1929 1928 1927 1920 1910
Millions of Dollars
Billions of Kw.-Hr.
Middle Atlantic
East North Central
South Atlantic
New England
Pacific
West North Central
West South Central
East South Central
Mountain
Revenues by Geographical Regions 1912 and 1930
Energy by Geographical Regions 1912 and 1930
1912
1930


FUEL AND WATER MAKE ELECTRICITY
Energy Generated from Fuel by Regions
(Legend on Lower Chart)
Total Energy Generated by Regions
(Legend on Lower Chart)
Billions of Kilowatt-hours
90
80
70
60
50
40
30
20
10
1912
1917
1922
1927
1928
1929
1930
Total Generator Rating in Utility Plants
(Per cent water power in uncolored sector)
28.5 %
1912
5,165,439 Kw.
30.9 %
1917
8,994,407 Kw.
30.5 %
1922
14,313,438 Kw.
26.0 %
1928
27,116,000 Kw.
26.5 %
1927
25,811,305 Kw.
25.2 %
1929
29,558,637 Kw.
25.7 %
1930
31,500,000 Kw.
Energy Generated from Water Power by Regions
KEY
New England
Middle Atlantic
East North Central
West North Central
South Atlantic
East South Central
West South Central
Mountain
Pacific
Billions of Kilowatt-hours
40
30
20
10
1912
1917
1922
1927
1928
1929
1930


TWO DECADES
IN TELEPHONE FIELD
(1930 Partly Estimated)
$4,620,000,000
Total Telephone
INVESTMENT
in U.S.
Land, building and central office equipment
Substation equipment, cons. work in progress, etc.
Underground and aerial
(1930 partly estimated)
Billions of Dollars
1910
1920
1930
82,900,000
Average number of daily telephone CONVERSATIONS
Scale at right
$1,240,000,000
Gross operating REVENUE
Scale at left
20,250,000
Total TELEPHONES in U.S.
Scale at right
Millions of Dollars
Millions
BELL SYSTEM
41,335,000
Miles of
EXCHANGE
CABLE
Underground
Aerial
Million Miles
4,231,000
Miles of
TOLL CABLE
Underground
Aerial
Million Miles
4,014,000
Number of
DIAL
TELEPHONES
Million Sets


ELECTRICAL MANUFACTURING
DOUBLED IN THE LAST DECADE
Value of Groups of Electrical Products 1910—1940
Million Dollars
300
275
250
225
200
175
150
125
100
75
50
25
0
1910 1920 1930 1940
Gen. M.G. Substation
Heating and Cooking Appliances
Insulated Wire and Cable
Incandescent Lamps
Motors and Parts
Radio Apparatus
Swbd. C.B. and Switches
Telephone Apparatus
Transformers
Wiring Devices
Electrical Products and Exports
Exports
Total Value
1940
1930
1920
1910
0
500
1,000
1,500
2,000
2,500
Growth in Exports
Million Dollars
0
50
100
150
200
250
UNIT VALUES
Electrical vs. all Industries
Electrical manufacturing
All industries
VALUE OF PRODUCTS PER WAGE EARNER (Dollars)
10,000
8,000
6,000
4,000
2,000
WAGES PER WAGE EARNER (Dollars)
1,800
1,400
1,000
600
200
PRIMARY HORSEPOWER PER WAGE EARNER
Horsepower
5
4
3
2
1
1910
1920
1930
1940


PRIVATE ENTERPRISE PRODUCES INTERNATIONAL RECORDS
America First in Production of Power
Kw.-hr. per Capita
Billions of Kw.-hr.
Annual Output, Billions of Kw.-hr.
Kw-hr per Capita
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
120
110
100
90
80
70
60
50
40
30
20
10
0
229
3.3
1,043
561
815
43
3,560
264
178
378
356
2124
535
1,025
Czecho Slovakia
Switzer-land
Belgium
Sweden
Russia
Norway
Italy
Japan
France
Great Britain
Canada
Germany
United States
1930 $ 960,190,000
1929 $ 866,334,000
1928 $ 786,978,000
1927 $ 760,353,000
1926 $ 841,334,000
1925 $ 721,300,000
1924 $ 692,440,000
1923 $ 602,143,000
1922 $ 324,916,000
1921 $ 222,408,000
Utility Capital Expenditures
$7,000,000,000 in a Decade
0 100 200 300 400 500 600 700 800 900
Million Dollars
1930*
1929
1928
1927
1926
1925
1924
1923
1922
1921
1920
Utility Security Issues
$13,372,000 in a Decade
Customer Sales
Public Issues and Rights
2,000 1,750 1,500 1,250 1,000 750 500 250 0
* Estimated Nov 15
Million Dollars

1931 BUDGET $894,000,000

Light and power companies expect to spend $894,000,000 in 1931 for new plant and equipment. This compares favorably with the 1930 expenditure of $960,000,000. Distribution the major item

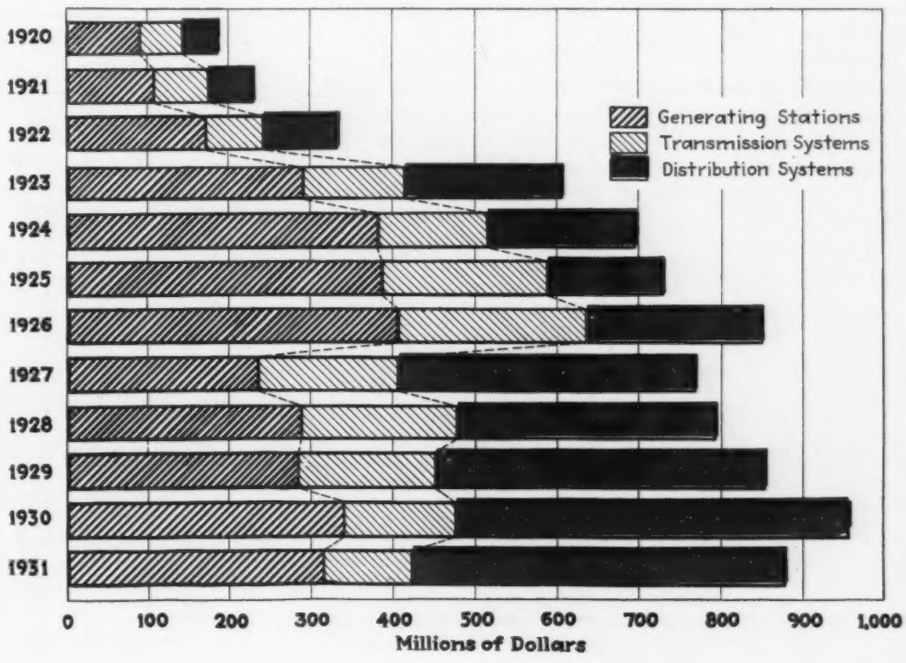
LETTERS and telegrams to the ELECTRICAL WORLD from light and power company executives indicate a 1931 budget of $894,000,000 and expenditures in 1930 of $960,000,000 for new plant and equipment. Despite the business depression the utilities have gone ahead with their expansion programs in excess of budget predictions. The drop in the power business and in the building industry made it possible to postpone some extensions and unnecessary to expand existing service facilities in some instances. But in generation, transmission, substations and distribution of a general nature an abnormal expansion program was maintained. In some measure this was done to conform to the requests and plans of President Hoover; but past experience indicates that this is good business, because load returns quickly with a business upturn and, in addition, prices for money, materials, equipment and labor were very satisfactory during the year. Thus the business depression affected utility capital expenditures very slightly.

The 1931 budget of $894,394,716 is allocated as follows: Fuel-burning stations, $202,394,816; hydro stations, $105,381,392; transmission, $114,986,418; distribution and substations, $412,131,669; miscellaneous, $59,113,102. These figures include municipal, local and all other light and power properties, and are predicated on actual returns of $819,000,000. Comparative figures for 1930 expenditures are: Fuel plants, $207,901,458; hydro plants, $117,395,384; transmission, $137,084,606; distribution and substations, $432,570,278; miscellaneous, $65,938,026.

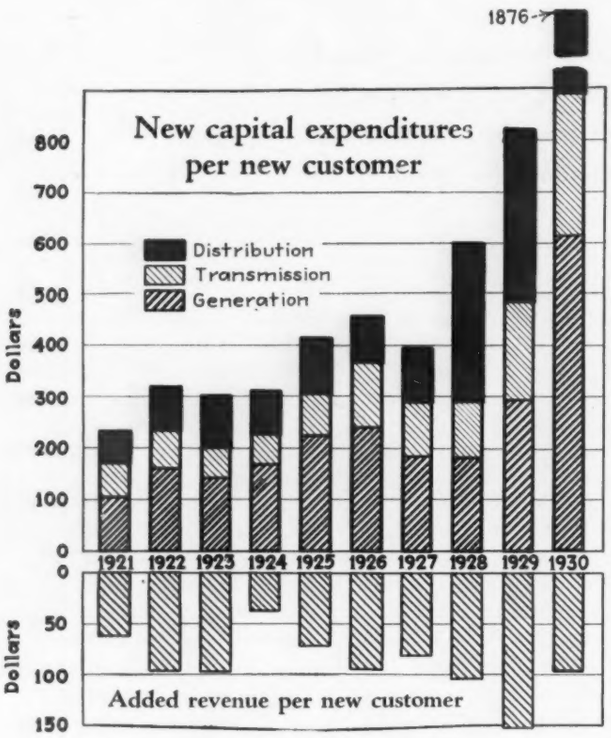
A decrease in New England expenditures for 1931 is accounted for by the completion of several large hydro plants in 1930. In the South, also, several new lines and plants have been installed that permitted a temporary reduction in expenditures. In the North Central, Western and Eastern districts it will be noted that budget expenditures for 1931 are about equal to those of 1930, thus indicating a normal industry growth. A study of the table of generating station construction in an accompanying article gives evidence of the step-by-step construction of generating plants through additions on an existing site and also shows that capacity is being added at a normal rate of about 2,500,000 kw. per year.

The accompanying tables show the distribution of the

$6,777,326,000 new capital expenditures in last decade



1930 expenditures and the 1931 budget in major divisions. It will be noted that distribution is the chief item, as it has been for the past few years. This results from the increased trend to underground, the extensions to outlying customers, the modernization and revamping of distribution systems, the construction of distribution substations and the building of new general office buildings.



Generation takes second place and bids fair to go ahead more rapidly than distribution in the future because of a steady increase in capacity demands. Transmission expenditures are about normal and may be expected to maintain their present position.

The period from 1920 to 1926 was marked by a very rapid growth of capital expenditures. This came about because of the abnormal lack of expansion just following the war, followed by a rapid pick-up in load and the expansion of facilities on a widespread power supply basis. Following this period the trend is more normal and one that may be expected to continue for some years. An interesting aspect of the expenditures is that the magnitude is so great in each major division that no

Table II—System Expenditures by Sections

	Eastern	Southern	North Central	Western
1921	$43,136,000	$29,341,000	$67,900,000	$82,031,000
1922	101,525,000	49,805,000	96,700,000	75,986,000
1923	211,196,000	82,105,000	206,180,000	102,662,000
1924	259,196,000	104,460,000	218,950,000	109,180,000
1925	190,300,000	130,500,000	260,200,000	140,300,000
1926	200,107,000	190,500,000	280,605,000	170,132,000
1927	247,961,000	191,190,000	213,994,000	107,208,000
1928	253,277,000	182,322,000	244,060,000	107,319,000
1929	265,847,000	176,585,000	293,564,000	130,348,000
1930	308,596,932	194,395,948	318,096,822	139 800,040
1931	301,840,195	171,752,695	284,789,876	135,624,531

Table I—Generation and Transmission Expenditures

(Thousands of Dollars)

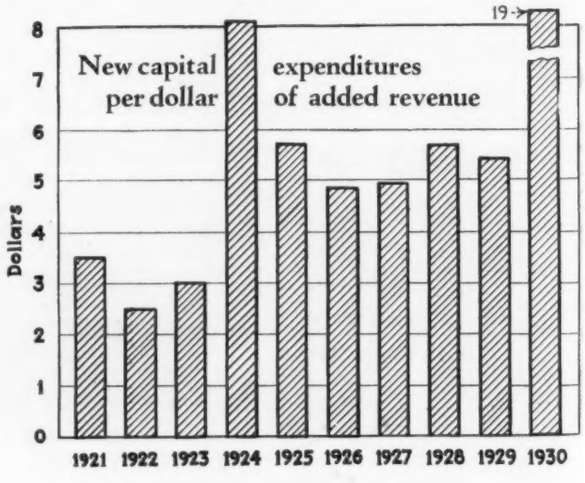
Year	Total Construction Budgets	Total Expenditures for Generating Plants	Total Expenditures for Transmission and Distribution	Miscellaneous† Expenditures
1921	$222,408	$102,674	$119,734	.....
1922	324,016	164,333	159,683	.....
1923	602,143	283,813	318,330	.....
1924	692,440	379,240	313,200	.....
1925	721,300	380,000	341,300	.....
1926	841,344	400,107	441,237	.....
1927	760,353	234,883	525,470	.....
1928	786,978	284,874	453,796	48,308
1929	866,344	281,460	528,896	55,988
1930	960,889	325,296	569,654	65,938
1931	894,007	307,776	527,118	59,113

†Not separated in earlier years.

cyclical effect is evident, despite large increment building projects in some regions in some years followed by a loading period. These fluctuations are washed out in the national expenditures to show a steady enlargement of facilities proportional to load growth.

During the period from 1920 to 1930 the light and power companies spent a total of $6,007,326,000 for new plant and equipment, yet from 1930 to 1940 a reasonable estimate for expenditures is $11,400,000,000—an enormous sum. The investment per unit of generating capacity for the decade has decreased slightly and is now about $325. The per cent of total time generating equipment is used has increased from 20 to 30 in the same period. The kilowatt-hours generated per unit of capacity has increased from about 1,100 to 2,700 in the ten years. The revenue and investment values per customer have remained about stationary, the present values being about $500 for investment and $100 for revenue. These figures show that there has been a fairly uniform earnings basis over the decade despite enormous expenditures and lowered rates, and this has been made possible by greater hours' use of equipment, decreased unit costs of equipment and better operating performance, especially in fuel-burning power stations.

A study of new capital expenditures on an increment basis, however, shows reason for thought. The new



capital spent per added new customer in 1921 was $250, and this increased steadily to a figure of $1,876 in 1930—an abnormal value. During the same period the added revenue per added new customer increased from $65 to $97—a small percentage. The deficit in this ratio is cared for by better operating ratios in the last few years.

Another increment figure of interest lies in the fact that the new capital spent per dollar of added revenue in 1921 was $3.50 and in 1930 about $19. Lowered rates for money and better operating ratios compensated for this change also, and the trend is not upward today.

From these increment cost and return studies and the studies for total and unit system investments and earnings it is seen that the 1920-1930 decade recorded a flat earnings record; i.e., the profits in the business kept pace with its expansion on about the same percentage basis. The industry proved that it could maintain fair and stable earnings during all the fluctuations in capital expenditures, operating costs and load revenues.

In the next decade there is every reason to believe that the capital requirements of the industry—some $11,400,000,000—can be had at a reasonable money cost. There are reasons to believe that the hours' use of equipment will be increased and that operating costs will decrease. In some measure equipment costs will decrease because of improved quality and changed designs. But the greatest possibility lies in so assembling light and power systems that standard units can be used that permit of mass production in manufacture. Much work is being done on the assembly of equipment to serve light and power customers to conform to the standard and mass production goals that will permit major cost reductions to be made in caring for future load growth.

There is also reason to believe that in the next decade distribution equipment will require the largest capital expenditures, with generating stations and transmission lines following in order of magnitude. Estimates for expenditures in the decade 1930 to 1940 are as follows: Distribution, $4,400,000,000; generation, $3,700,000,000; transmission, $2,250,000,000. The remainder of the capital expenditures in the decade would come under miscellaneous expansions, such as office buildings, stores, etc.

Table III—Steam Power Plant Expenditures

(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$80,107	$30,000	$120,000	$25,000	$255,107
1927	53,593	35,128	43,585	13,711	146,017
1928	49,841	45,537	58,749	16,906	171,033
1929	53,891	37,600	75,299	15,758	182,548
1930	56,226	35,866	94,013	21,794	207,901
1931	54,945	33,264	97,147	17,037	202,394

Table IV—Hydro Plant Expenditures

(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$20,000	$60,000	$20,000	$45,000	$145,000
1927	39,436	21,913	6,020	21,497	88,866
1928	38,717	43,926	8,610	22,588	113,841
1929	28,784	21,575	25,071	23,482	98,912
1930	36,461	31,229	17,746	39,007	117,395
1931	30,399	27,241	14,444	33,296	105,381

Table V—Transmission Expenditures

(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$50,000	$60,456	$60,605	$60,000	$231,061
1927	32,147	47,830	61,055	22,121	163,153
1928	71,097	28,999	67,519	18,575	186,190
1929	44,015	35,059	60,589	27,902	167,565
1930	42,601	33,910	48,910	15,662	137,085
1931	37,413	23,160	33,080	21,332	114,987

Table VI—Distribution Expenditures

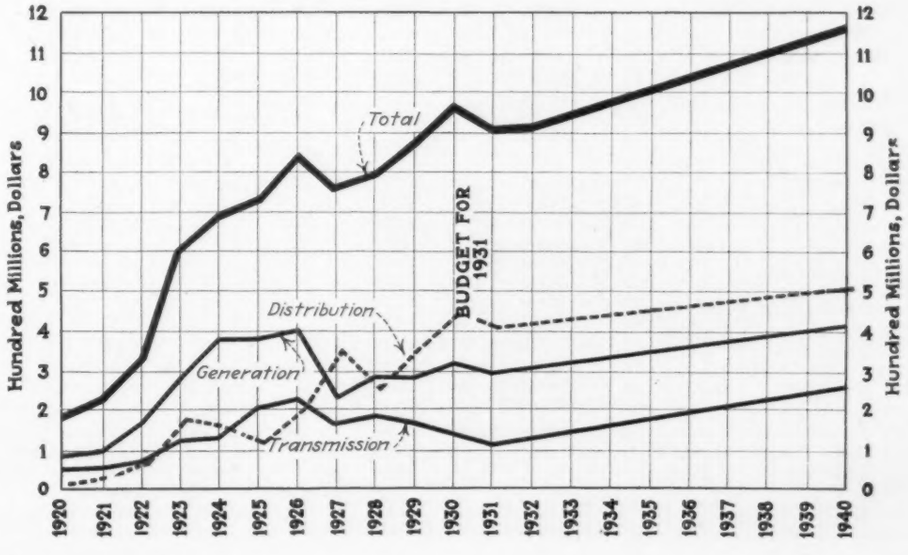
(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$50,000	$40,044	$80,000	$40,132	$210,176
1927	122,785	86,320	103,344	49,878	362,317
1928	80,927	51,753	88,960	45,966	267,606
1929	122,401	73,457	109,444	56,029	361,331
1930	152,762	103,079	128,784	58,540	432,570
1931	158,468	79,069	118,287	56,506	412,122

Utility capital expenditures

1920-1930
$6,777,326,000

1930-1940
$11,400,000,000



Capacity of Generators in Public Utility Power Plants*

November, 1930—United States Geological Survey

	Companies†	Plants	Total Capacity Kw.	Generator Capacity in Kilowatts of Plants Operated By One Type of Prime Mover: Water Power No.	Water Power Kw.	Steam Power No.	Steam Power Kw.	Internal Combustion Engine No.	Internal Combustion Engine Kw.	Combination of Two or More of Others No.	Kw. Total	Water Power	Steam Power	Int. Comb. Engines
UNITED STATES	1,590	3,867	33,403,281	1,321	8,445,306	1,495	23,698,717	764	311,539	287	947,719	284,849	567,595	95,275
New England	155	335	2,823,884	215	732,197	83	1,955,785	6	4,082	31	131,820	20,685	109,460	1,675
Middle Atlantic	161	418	8,357,541	193	1,222,437	180	6,947,100	18	18,632	27	169,372	124,885	42,045	2,442
East North Central	314	686	7,766,523	255	571,016	356	6,944,920	31	17,519	44	233,068	27,702	198,308	7,058
West North Central	362	716	2,377,168	104	320,310	285	1,842,284	256	94,214	71	120,360	13,331	79,705	27,324
South Atlantic	179	464	4,126,775	154	1,669,271	190	2,276,902	92	39,804	28	140,798	60,029	75,549	5,220
East South Central	78	218	1,565,526	33	799,331	99	696,132	70	17,850	16	52,213	23,715	19,732	8,766
West South Central	133	433	1,493,168	13	17,945	153	1,322,305	239	96,781	28	56,137	1,080	34,819	20,238
Mountain	133	312	1,150,164	158	774,991	82	322,992	42	15,461	30	36,720	9,212	6,247	21,261
Pacific	75	285	3,742,532	196	2,337,808	67	1,390,297	10	7,196	12	7,231	4,210	1,730	1,291
NEW ENGLAND														
Maine	31	80	214,287	69	161,605	6	49,730	1	557	4	2,395	1,200	940	255
New Hampshire	17	51	255,768	37	208,313	5	21,955	1	480	8	25,020	4,050	20,050	920
Vermont	24	70	178,369	60	162,709	4	11,200	...	.....	6	4,460	1,750	2,710	.....
Massachusetts	55	85	1,333,445	26	120,365	47	1,135,840	3	2,565	9	74,675	11,005	63,170	500
Rhode Island	4	7	242,950	3	1,750	4	241,200	...	.....	...	.....	.....	.....	.....
Connecticut	24	42	599,065	20	77,455	17	495,860	1	480	4	25,270	2,680	22,590	.....
MIDDLE ATLANTIC														
New York	80	253	4,872,520	159	1,118,087	75	3,734,685	5	8,408	14	11,340	5,970	4,210	1,160
New Jersey	16	31	928,605	4	1,100	23	913,215	2	1,740	2	12,550	5,100	7,450	.....
Pennsylvania	65	134	2,556,416	30	103,250	82	2,299,200	11	8,484	11	145,482	113,815	30,385	1,282
EAST NORTH CENTRAL														
Ohio	70	106	2,138,801	8	10,380	87	2,056,666	6	2,010	5	69,745	2,695	66,700	350
Indiana	57	109	930,532	17	31,020	83	882,870	6	3,592	3	13,050	3,800	9,035	215
Illinois	61	112	2,332,164	15	45,500	86	2,200,009	6	3,830	5	82,825	5,535	76,555	735
Michigan	65	175	1,542,747	107	250,360	50	1,278,835	8	3,182	10	10,370	2,035	4,660	3,675
Wisconsin	61	184	822,279	108	233,756	50	526,540	5	4,905	21	57,078	13,637	41,358	2,083
WEST NORTH CENTRAL														
Minnesota	59	117	508,858	39	146,990	56	349,668	10	2,649	12	9,551	2,050	4,396	3,105
Iowa	66	142	563,064	26	146,600	71	344,773	30	14,889	15	56,802	5,403	45,491	5,908
Missouri	59	105	608,754	4	9,920	47	574,842	46	18,942	8	5,050	150	2,160	2,740
North Dakota	15	35	56,295	....	.....	20	53,395	14	2,350	1	550	.....	250	300
South Dakota	25	52	60,233	5	4,200	14	35,928	30	9,020	3	11,085	.....	9,030	2,055
Nebraska	64	134	208,076	23	6,785	40	167,235	50	13,982	21	20,074	3,761	8,999	7,314
Kansas	74	131	371,888	7	5,815	37	316,443	76	32,382	11	17,248	1,967	9,379	5,902
SOUTH ATLANTIC														
Delaware	7	7	32,265	....	.....	5	31,350	2	915	...	.....	.....	.....	.....
Maryland	17	29	619,847	3	252,785	17	345,240	8	2,562	1	19,260	19,200	.....	60
Dist. of Columbia	3	3	198,900	1	2,400	2	196,500	...	.....	...	.....	.....	.....	.....
Virginia	28	80	417,782	35	69,349	23	269,414	14	4,508	8	74,511	14,053	59,790	668
West Virginia	18	45	559,964	8	56,170	26	499,460	8	3,942	3	392	135	62	195
North Carolina	34	87	994,240	52	643,180	24	339,195	7	2,703	4	9,162	6,461	2,000	701
South Carolina	18	47	524,073	22	359,955	19	141,001	2	190	4	22,927	16,200	6,397	330
Georgia	19	75	411,822	30	271,182	36	131,469	7	1,691	2	7,480	3,780	3,500	200
Florida	35	91	367,882	3	14,250	38	323,273	44	23,293	6	7,066	200	3,800	3,066
EAST SOUTH CENTRAL														
Kentucky	19	53	341,149	3	104,860	34	224,147	9	1,752	7	10,390	315	3,225	6,850
Tennessee	30	58	335,449	19	103,961	24	189,675	11	2,451	4	39,362	23,200	15,570	592
Alabama	10	45	834,165	11	590,510	17	239,260	16	3,955	1	440	200	240	.....
Mississippi	19	62	54,763	....	.....	24	43,050	34	9,692	4	2,021	.....	697	1,324
WEST SOUTH CENTRAL														
Arkansas	18	77	90,934	4	10,855	41	71,581	29	5,254	3	3,244	.....	1,134	2,110
Louisiana	26	48	231,256	....	.....	10	214,460	35	12,534	3	4,262	.....	2,712	1,550
Oklahoma	46	103	292,085	2	1,500	38	257,762	56	28,796	7	4,027	200	1,257	2,570
Texas	43	205	878,893	7	5,590	64	778,502	119	50,197	15	44,604	880	29,716	14,008
MOUNTAIN														
Montana	10	32	310,278	18	300,014	8	7,710	3	814	3	1,740	400	375	965
Idaho	18	46	227,870	40	221,250	3	2,050	...	.....	3	4,570	3,800	.....	770
Wyoming	20	34	47,653	8	11,230	16	32,435	8	2,996	2	992	400	472	120
Colorado	31	64	233,026	22	50,807	34	178,191	3	863	5	3,165	1,750	600	815
New Mexico	16	29	42,863	....	.....	12	32,316	11	5,649	6	4,908	981	1,911	2,016
Arizona	15	39	137,257	11	87,050	8	29,290	14	3,674	6	17,243	.....	2,539	14,704
Utah	19	58	140,430	53	95,790	1	41,000	1	465	3	3,175	1,740	.....	1,435
Nevada	4	10	10,777	6	8,850	....	.....	2	1,000	2	927	141	350	436
PACIFIC														
Washington	28	74	730,007	45	541,165	21	184,657	1	48	7	4,137	2,216	970	951
Oregon	21	64	314,903	38	154,030	17	156,640	4	1,139	5	3,094	1,994	760	340
California	26	147	2,697,622	113	1,642,613	29	1,049,000	5	6,009	...	.....	.....	.....	.....

*The table relates to all public utility plants of 100 kw. or larger. This is a more comprehensive classification than electric light and power; it embraces also electric railway and other plants generating energy used for public utility purposes.

The omission of the very small plants does not appreciably affect the aggregate rating or output. In 1927 there were about 1,000; the number tends to decrease. The omission correspondingly affects the number of operating companies or establishments. This approaches the number of plants, since the latter usually serve isolated villages and hamlets, and are owned singly either by local companies or by the municipalities.

†Only companies that have generating plants. Excludes those purchasing all their energy. Includes municipalities.

Plant Capacity Rises More than 2,000,000 Kw.

PUBLIC utility power plants in operation at the end of 1930 numbered about 3,870, with an aggregate installed capacity of 33,860,781 kw., of which 24,551,312 kw. was in steam, 8,902,655 kw. in water power and 406,814 kw. driven by internal combustion engines.

This summary includes not only central stations for electric light and power but also plants for electric railway operation and various others contributing to the energy supply for public utility purposes. It does not include plants of less than 100 kw. The figures are based on data compiled as of November 1, accounting for 33,403,281 kw., plus known additions during the two last months of the year.

At the end of 1929 there were in operation 31,952,396 kw.—steam 23,255,692 kw., water power 8,316,591 kw., internal combustion 380,113 kw. The net increase of 1,908,385 kw. consisted, in round numbers, of 1,296,000 kw. in steam, 586,000 kw. in water power and 26,700 kw. driven by internal combustion engines.

Nearly three-fourths of the total installed public utility plant capacity in the country is driven by fuel, and in the main by means of steam turbines; water power accounts for a little more than 26 per cent.

Nearly 32,000,000 kw. in central stations alone

It has been stated that the preceding statistics comprised other than central stations. The difference is about 2,000,000 kw. If attention is confined to the light and power industry alone, the end of the year finds 31,836,243 kw. of total capacity; again 26 per cent is water power.

The industry started the year with 21,743,602 kw. in steam, 7,438,882 kw. in water power and 376,153 kw. driven by internal combustion engines. The year's increase, close to 2,280,000 kw., shows virtually normal growth. Temporarily, this may involve a slight excess of capacity compared with normal years, but in that connection several considerations need to be taken into account.

1. Plants and extensions completed during 1930 were started before the business depression set in.

2. Both 1929 and 1930—the latter particularly—were years of unusually low water. The available output from hydro plants was seriously curtailed. This called for more output from steam by individual companies; over certain large areas the combined output of all companies was greater than in 1929.

3. To minimize unemployment many industrial establishments met the need of diminishing their output by decreasing the working hours per week, rather than by reducing their operating forces. Consequently, central stations found that their maximum loads were no smaller than last year, though the kilowatt-hour sales fell off. The few reports of December peaks in hand as this is written indicate a rise over all previous records. There had to be enough capacity to meet them.

The preceding analysis does not take account of plants smaller than 100 kw. Exact statistics on these are not available. Classified by prime movers, probably the only

*Output of Central-Station Hydro and Fuel Power Plants**

(100 per cent of the industry)

	Energy Generated During 1928				Energy Generated During 1929				Energy Generated During 1930†			
	Hydro Plants		Fuel Power Plants		Hydro Plants		Fuel Power Plants		Hydro Plants		Fuel Power Plants	
	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total
UNITED STATES	33,508	40.4	49,418	59.6	32,390	35.4	59,031	64.6	31,194	34.6	58,882	65.4
New England	2,305	43.0	3,045	57.0	1,937	32.3	4,060	67.7	2,001	34.8	3,745	65.2
Middle Atlantic	6,296	31.4	13,738	68.6	5,707	26.5	15,898	73.5	5,842	26.6	16,111	73.4
East North Central	2,539	12.3	17,998	87.7	2,220	9.8	20,566	90.2	1,948	9.0	19,666	91.0
West North Central	1,588	33.0	3,228	67.0	1,464	27.1	3,923	72.9	1,313	22.9	4,419	77.1
South Atlantic	5,521	53.3	4,841	46.7	6,553	55.7	5,210	44.3	5,540	49.9	5,564	50.1
East South Central	2,428	79.5	628	20.5	2,628	77.4	770	22.6	2,489	75.5	809	24.5
West South Central	53	1.2	3,974	98.8	73	1.5	4,817	98.5	54	1.1	4,955	98.9
Mountain	3,297	88.5	426	11.5	3,157	83.4	628	16.6	2,949	82.7	615	17.3
Pacific	9,483	86.1	1,539	13.9	8,651	73.3	3,159	26.7	9,058	75.1	2,998	24.9

*Data collected by U. S. Geological Survey. †Based on ten months' operations.

Total Energy and Fuel-Generated Energy in Public Utility Plants

Including electric light and power, electric railway, Bureau of Reclamation and certain other plants generating energy for public consumption.

Year	Kw.-Hr. Generated in All Public Utility Plants (Millions)	Kw.-Hr. Generated from Fuel (Millions)	Coal Consumed (Millions of Tons)	Coal Equivalent of All Fuel† (Millions of Tons)	Pounds of Coal per Kw.-Hr.‡
1919	38,921	24,176	35.10	38.88	3.2
1920	43,555	27,248	37.13	41.43	3.0
1921	40,976	25,863	31.59	35.25	2.7
1922	47,659	30,240	34.18	38.01	2.5
1923	55,674	36,092	38.96	43.53	2.4
1924	59,014	38,808	37.56	42.14	2.2
1925	65,870	42,264	40.23	44.79	2.1
1926	73,791	47,274	41.32	45.86	1.95
1927	80,205	50,330	41.88	45.91	1.84
1928	87,850	53,154	41.35	46.39	1.76
1929	97,352	62,723	44.94	52.57	1.69
1930*	96,021	62,746	43.11	50.84	1.63

*Estimated, based on ten months' operations.
†Includes oil and natural gas, but not wood.
‡Excluding output from wood burning plants.

group that would be appreciably affected would be those driven by internal combustion engines. The census of 1927 gives these an aggregate rating of 416,533 kw., for all sizes. On this basis the corresponding rating for 1930 may be increased to 500,000 kw., or slightly more, if the very small plants are included.

As in the case of plant capacity, there are two sets of statistics for output: Those for all public utility plants and those for central stations alone. The former is estimated at 96,021,000,000 kw.-hr. in 1930, against 97,352,000,000 kw.-hr. in 1929; the latter at 90,076,000,000 kw.-hr., against 91,421,000,000 kw.-hr. This is the first decrease since 1921, and amounts to 1.5 per cent.

The use of hydro-electric plants for carrying as much of the load as possible is revealed by comparing the energy generated by these plants with the plant rating. The output constitutes nearly 35 per cent of the total; the plant capacity 26 per cent of the total installation.

Only three of the nine geographical sections derived more than half their central station output from water power: The East South Central, 75.5 per cent; the Mountain, 82.7 per cent, and the Pacific, 75.1 per cent. In the South Atlantic States the production from fuel and that from water power were almost evenly divided; in years of average stream flow water power predominates.

In every geographical division except the easternmost and westernmost ones the percentage generated from fuel was larger in 1930 than in 1929, and in five of them the output was not only relatively but absolutely larger. The necessity of adequate steam plant capacity to combat a scarcity of water power is evident.

The consumption of fuel in pounds of coal or its equivalent in other fuels per kilowatt-hour has again been reduced, continuing the steady improvement recorded in the past. In 1929 it was 1.69 lb.; in 1930 it was 1.63 lb. The improvement since the early days of the industry has been stupendous. It has been estimated that in 1883 some eleven pounds of coal were required, on the average, to generate a kilowatt-hour. By 1900 the consumption had been cut in half, or somewhat better. Nationwide statistics date back to 1919, when the Geological Survey began collecting data on central station output and fuel consumption. In that year 3.2 lb. was required. During the succeeding eleven years that figure has been nearly halved. These are national averages, combining the efficient plants and the inefficient. The technical advances through which that remarkable conservation of natural resources has been achieved need not be recounted here.

One point, though frequently mentioned in discussions of this subject, may again be noted. The continued improvement in efficiency of generation from fuels relegates water power more and more to a condition of minor importance in an economic sense. Further progress is desirable and is to be anticipated, but its influence on the cost of electric service to the ultimate consumer must be increasingly overshadowed by other and much larger items, particularly in the case of the small consumer. The very fact of the economies attained in power production forces those other factors into the foreground.

Kilowatts of Generating Capacity in the Electric Light and Power Industry as of October 31, 1930

	Type of Prime Mover			
	Steam	Water Power	Internal Combustion	Total
New England	1,739,660	729,456	5,757	2,474,873
Middle Atlantic	6,209,725	1,195,727	21,074	7,426,526
East North Central	7,058,748	546,103	24,577	7,629,428
West North Central	1,837,539	316,897	119,778	2,274,214
South Atlantic	2,287,571	1,423,759	43,824	3,755,154
East South Central	707,264	684,966	26,616	1,418,846
West South Central	1,428,202	19,025	117,019	1,564,246
Mountain	288,264	758,738	37,297	1,084,299
Pacific	1,489,247	2,253,423	8,487	3,751,157
Totals	23,046,220	7,928,094	404,429	31,378,743
Added after October 31, 1930	285,000	172,500	.....	457,500
December 31, 1930 totals	23,331,220	8,100,594	404,429	31,836,243

*Consumption of Fuel by Central-Station Steam Power Plants**

(100 per cent of the industry)

	Coal (Thousands Short Tons)			Fuel Oil (Thousands Barrels)			Gas (Millions Cubic Feet)		
	1928	1929	1930†	1928	1929	1930†	1928	1929	1930†
UNITED STATES	37,593	41,406	39,393	6,852	9,740	8,646	77,054	112,442	121,281
New England	2,214	2,679	2,321	541	1,524	1,447	0	0	0
Middle Atlantic	10,714	11,919	11,718	280	280	257	92	91	84
East North Central	15,305	16,674	15,270	85	80	104	4,207	4,071	4,552
West North Central	3,252	3,767	3,994	935	946	828	8,739	11,657	13,823
South Atlantic	3,515	3,659	3,915	2,035	2,219	2,105	187	153	89
East South Central	821	786	731	78	98	96	0	3,425	3,782
West South Central	1,262	1,219	894	1,128	926	893	50,149	65,299	70,536
Mountain	469	606	540	234	404	450	831	832	953
Pacific	42	97	10	1,536	3,263	2,466	12,849	26,914	27,462

*Data collected by U. S. Geological Survey. †Based on ten months' operations.

NEW STATIONS—5,000,000 Kw.

Utility generating station capacity now 34,000,000 kw.
2,789,437 kw. installed in 1930.
2,106,600 kw. announced to follow.
Business depression has no effect on plant construction program.

DURING 1930 the light and power companies installed a total generating capacity of 2,789,437 kw. Of this total 2,040,957 kw. was in fuel-burning plants and 748,480 kw. in hydro. These installations were made either as extensions to existing stations or in new stations.

In addition, new construction already announced comes to 2,106,600 kw., divided into 1,242,000 kw. for steam and 864,600 kw. for water power. Most of this is for completion during 1931. Further additions will no doubt be reported as the year progresses; meanwhile, such large projects as Hoover Dam and the St. Lawrence are in the offing.

The aggregate rating of public utility plants is now close to 34,000,000 kw., all but 2,000,000 kw. of it in central stations for light and power. On November 1 the 3,867 plants (of 100 kw. or larger) of 1,590 public utility companies had 33,403,281 kw. In large plants alone 457,500 kw. has since gone into service. The total is 2.7 times as great as that at the beginning of 1920 and every indication points to a continuation of this rate of increase during the next decade.

Present trends in power station construction show that steam capacity added each year is more than double that of hydro. It is also evident that steam plants are expanded largely by step-by-step additions, while hydro

Power Plant Capacity Scheduled to Be Completed in 1931

Steam-Electric Plants

Company	Station and Location	Added to Existing Plants, Kw.	New Plants, Kw.	Ultimate Capacity, Kw.
MIDDLE ATLANTIC STATES				
Brooklyn Edison Co., Inc..	Hudson Ave.....	160,000	.....	.....
Buffalo General Elec. Co..	Huntley (Buffalo).	80,000	.....	.....
Vil. of Freeport, L.I., N. Y. (*Scheduled for* 1932)	Freeport.....	*2,060	.....	.....
Brooklyn Edison Co., Inc..	Hudson Ave.....	160,000	.....	.....
EAST NORTH CENTRAL STATES				
The Detroit Edison Co....	Delray No. 3.....	50,000	.....	.....
Indianapolis Pwr. & Lt. Co.	Harding St. Plant..	.....	73,500	140,000
Michigan Elec. Pwr. Co...	Lapeer.....	330	.....	730
The Milwaukee Elec. Ry. & Lt. Co.....	Port Washington (Washington, Wis.).....		75,000	.....
Munic. Elec. Lt. & Pwr. Co.	Richmond, Ind....	15,000	.....	.....
No. Indiana Pub. Serv. Co.	Michigan City, Ind.	.....	64,000	120,000
Northwestern Illinois Util..	Savanna, Ill.....	2,000	.....	.....
Pub. Serv. Co. of N. Illinois	Waukegan.....	115,000	.....	.....
Super Power Co. of Illinois.	Powerton.....	105,000	.....	320,000
Wisconsin Pwr. & Lt. Co..	Sheboygan.....	.....	30,000	60,000
WEST NORTH CENTRAL STATES				
Federal Public Serv. Corp. of Minn.....	Jordan, Minn.....	250	.....	.....
Fort Dodge Gas & Elec. Co.	Fort Dodge (Iowa).	5,000	.....	.....
Interstate Pwr. Co. (Del.).	Dubuque, Iowa....	12,500	.....	37,500
Iowa Public Serv. Co.....	La Mars.....	.....	*560	.....
Iowa Ry. & Lt. Corp.....	Nevada, Iowa.....	*1,680	.....	*1,680
Iowa Ry. & Lt. Corp.....	Toledo, Iowa.....	.....	*840	*840
Iowa Southern Utilities Co.	Ottumwa.....	.....	10,000	.....
Minnesota Pwr. & Lt. Co..	Duluth, Minn.....	.....	20,000	200,000
Montana Dakota Pwr. Co.,	Williston, S. D.....	2,000	.....	10,000
No. Dakota Pwr. & Lt. Co.	Mandan, N. D.....	.....	7,500	30,000
Northern States Pwr. Co..	Riverside (Minneapolis, Minn.)...	35,000	.....	.....
The Western Pub. Serv. Co.	Orleans, Neb.....	.....	*720	.....
SOUTH ATLANTIC STATES				
The M'yland Lt. & Pwr. Co.	St. Michaels, Md..	.....	*560	.....
Potomac Electric Pwr. Co..	Bennings (Washington, D. C.)...	30,000	.....	.....
Quattlebaum Lt. & Ice Co.	Conway, S. C.....	500	.....	.....
Virginia Public Service Co.	Bremo (Bremo Bluff, Va.).....	.....	30,000	200,000
Virginia Public Service Co.	Hampton (Va.)....	15,000	.....	.....
WEST SOUTH CENTRAL STATES				
Houston Ltg. & Pwr. Co..	Deepwater (Houst.)	47,000	.....	.....
Texas Utilities Co.....	Near Abernathy...	.....	.....	45,000
PACIFIC STATES				
City of Seattle, Dept. of Lighting.....	Lake Union (Seattle)	10,000	.....	40,000
Eugene Munic. Elec. System	Eugene, Oregon...	.....	6,000	24,000
Pacific Gas & Elec. Co. (Inc. Gt. Western Pwr. Co. & San Joaquin Lt. & Pwr. Co.)..... (Late 1931 or early 1932)	Sta. "A", San Fran.	50,000	.....	200,000
Pasadena, Calif. Municipal Lt. & Pwr. Dept.....	Glenarm St.....	25,000	.....	.....

Hydro-Electric Plants

Company	Station and Location	Added to Existing Plants, Kw.	New Plants, Kw.	Ultimate Capacity, Kw.
NEW ENGLAND STATES				
Central Maine Pwr. Co....	Wyman Dam (Bingham, Me.).....	.....	72,000	72,000
New England Pwr. Ass'n..	McIndoes.....	.....	10,000	10,000
Public Serv. Co. of New Hampshire.....	Ayers Island.....	3,900	.....	.....
Public Serv. Co. of New Hampshire.....	Eastman Falls.....	3,000	.....	.....
MIDDLE ATLANTIC STATES (*Scheduled for* 1932)				
Safe Harb. Wtr. Pwr. Corp.	Development on Susquehanna Riv.		168,000	336,000

Power Plant Capacity Scheduled to Be Completed in 1931—(Continued)

Company	Station and Location	Added to Existing Plants, Kw.	New Plants, Kw.	Ultimate Capacity, Kw.
WEST NORTH CENTRAL STATES				
Central States Pwr. & Lt. Corp.	Lebanon, Mo.	.....	3,000	3,000
Federal Public Serv. Corp. of Minn.	Rushford, Minn.	200	.....	.....
Union Elec. Lt. & Pwr. Co.	Osage River (Bagnell, Mo.)	.....	129,000	.....
SOUTH ATLANTIC STATES				
Appalachian Elec. Pwr. Co.,	Reusens	8,000	.....	.....
Florida Power Corp	Dunnellon	500	.....	.....
Georgia Power Co.	Furman Shoals (Milledgeville)	.....	45,000	.....
WEST SOUTH CENTRAL STATES				
Arkansas Pwr. & Lt. Co.	Carpenter (Ouachita River)	.....	56,000	.....
MOUNTAIN STATES (*After* 1931)				
Montana Pwr. Co.	Flathead	.....	112,000	.....
PACIFIC STATES				
Inland Pwr. & Lt. Co.	Ariel (Washington)	.....	45,000	.....
Pacific Gas & Elec. Co. (Inc. Gt. Western Pwr. Co. & San Joaquin Lt. & Pwr. Co.)	Tiger Creek	.....	60,000	.....
Pacific Gas & Elec. Co. (Inc. Gt. Western Pwr. Co. & San Joaquin Lt. & Pwr. Co.)	Salt Springs	.....	11,000	36,000
Puget Sound Pwr. & Lt. Co.	Rock Island	.....	15,000	180,000
So. Calif. Edison Co., Ltd. (*Late* 1931 *or early* 1932)	Borel	3,000	.....	12,000
City of Seattle, Dept. of Ltg.	Diablo (Skagit Riv.)	.....	120,000	240,000

plants are fully developed initially in most cases. Of steam capacity added in 1930, 1,075,323 kw. was in the form of additions to existing stations and 965,634 kw. in new stations. Of the hydro capacity added in the same period 148,200 kw. was additions to existing plants and 600,280 kw. in new stations.

In general, the large additions to generating capacity are found in the industrial sections of the country. The large metropolitan systems continue to add units of 100,000 kw. and above to reduce unit costs and operating expenses. It is to be noted, however, that many small steam and hydro additions are probably not reported in the tables, so that the proportion of large capacity units to small ones may be distorted slightly.

Power Plant Capacity Added During 1930

New plants and additions to existing plants that went into service during the year or were scheduled to be completed before its close.

Steam-Electric Plants

Company	Station and Location	Added to Existing Plants, Kw.	New Plants, Kw.	Ultimate Capacity, Kw.
NEW ENGLAND STATES				
Cambridge Elec. Light Co.,	Cambridge, Mass.	15,000	.....	.....
New England Pub. Serv. Co.	Floating Pwr. Plant Jacona	.....	20,000	.....
MIDDLE ATLANTIC STATES				
Brooklyn Edison Co., Inc.	Hudson Ave.	110,000	.....	.....
Buffalo General Elec. Co.	Huntley (Buffalo)	155,000	.....	.....
Duquesne Light Co.	James H. Reed	.....	60,000	240,000
East. New Jersey Pwr. Co.	Sayreville, N. J.	.....	63,000	180,000
Jersey Cent. Pwr. & Lt. Co.	South Amboy, N. J.	.....	50,000	300,000
Long Island Ltg. Co.	Glenwood No. 2	.....	75,000	.....
New Jersey Pwr. & Lt. Co.	Gilbert (Holland, N. J.)	.....	55,000	220,000
EAST NORTH CENTRAL STATES				
City of Detroit, Public Ltg. Commission	Mistersky	20,000	.....	120,000
Cleveland Elec. Illum. Co.	Ashtabula (Ohio)	.....	150,000	.....
Consumers Power Co.	Saginaw River	35,000	.....	.....
The Detroit Edison Co.	Delray No. 3	10,000	.....	.....
The Detroit Edison Co.	Marysville	50,000	.....	.....
Lansing, Mich., Board of Wtr. & Elec. Lt. Com'rs.	Moores Park	20,000	.....	65,000
The Milwaukee Elec. Ry. & Light Co.	Lakeside (St. Francis, Wis.)	75,400	.....	.....
Northwestern Illinois Util.	Savanna, Ill.	2,000	.....	.....
Pub. Serv. Co. of N. Illinois	Waukegan	65,000	.....	.....
St. Louis Gas & Coke Corp. (Industrial plant supplying pwr. to pub. utility)	Granite City, Ill.	.....	5,000	15,000
Super Pwr. Co. of Illinois	Powerton	105,000	.....	320,000
WEST NORTH CENTRAL STATES				
Central Kansas Pwr. Co.	Hoxie, Kansas	*‡600	.....	.....
Central Lt. & Pwr. Co.	Harvey, N. D.	.....	1,000	1,500
Central West Pub. Serv. Co.	Chamberlain, S. D.	*500	.....	.....
Central West Pub. Serv. Co.	Westhope, N. D.	.....	*300	.....
Central West Pub. Serv. Co.	Woonsocket, S. D.	*500	.....	.....
City Wtr. & Lt. Dept.	Hastings, Neb.	3,500	.....	.....
Eastern Minnesota Pwr. Co.	Lakeside	.....	2,000	.....
Interstate Pwr. Co. (Del.)	Bemidji, Minn.	.....	4,500	4,500
Interstate Pwr. Co. (Del.)	Dubuque, Iowa	15,000	.....	37,500
Iowa City Lt. & Pwr. Co.	Coralville (Iowa City, Iowa)	3,000	.....	.....
Iowa-Neb. Lt. & Pwr. Co.	Lincoln No. 3 (Lincoln, Neb.)	.....	6,000	12,000
Iowa Pub. Serv. Co.	Audubon	.....	*560	.....
Iowa Pub. Serv. Co.	Storm Lake	.....	*560	.....
Iowa Ry. & Lt. Corp.	Cedar Rapids, Iowa	5,000	.....	40,500
Iowa Ry. & Lt. Corp.	Perry, Iowa	1,000	.....	2,800
Kansas City Dept. of Wtr., Lt. & Pwr.	Quindaro	21,000	.....	100,000
Kansas Pwr. & Lt. Co.	Tecumseh	25,000	.....	.....
Nebraska Pwr. Co.	Omaha, Neb.	25,000	.....	.....
Northern States Pwr. Co.	Fargo, N. D.	3,000	.....	.....
Northern States Pwr. Co.	Minnesota Valley (Granite Falls, Minn.)	.....	20,000	30,000
Northern States Power Co.	Minot, N. D.	2,500	.....	.....
Otter Tail Pwr. Co.	Appleton, Minn.	.....	(a)*3,000	.....
Otter Tail Pwr. Co.	Langdon, N. D.	.....	(a)*1,500	.....
The Western Pub. Serv. Co.	Auburn, Neb.	*720	.....	.....
The Western Pub. Serv. Co.	Seneca, Neb.	.....	*104	.....

Power Plant Capacity Added During 1930—(Continued)

Company	Station and Location	Added to Existing Plants, Kw.	New Plants, Kw.	Ultimate Capacity, Kw.
SOUTH ATLANTIC STATES				
Appalachian Elec. Pwr. Co.,	Cabin Creek	5,000	.....	.....
Delaware River Mfg. Co...	Deepwater	.....	118,500	400,000
Duke Pwr. Co.	River Bend (Mt. Holly, N. C.)	.....	110,000	.....
East Coast Utilities Co....	Blowing Rock, N. C.	.....	*160	.....
Georgia Pwr. Co.	Atkinson	.....	60,000	.....
EAST SOUTH CENTRAL STATES				
Kentucky Utilities Co.....	Pineville	15,000	.....	.....
WEST SOUTH CENTRAL STATES				
Central Pwr. & Lt. Co....	Devils River (near Del Rio, Texas)	.....	(a) 15,000	.....
Central States Pwr. & Lt. Corp.	Allen, Okla.	.....	350	350
City Wtr. & Lt. Plant,	Jonesboro, Ark.	3,000	.....	.....
Dallas Pwr. & Lt. Co.....	Dallas, Texas	25,000	.....	.....
El Paso Elec. Co.	Rio Grande	.....	28,000	.....
Louisiana Steam Prod., Inc.	Louisiana (Baton Rouge)	.....	45,000	.....
Oklahoma Gas & Elec. Co.	Belle Island (Okla. City)	.....	35,000	.....
Public Serv. Co. of Okla...	Weleetka	15,000	.....	.....
San Antonio Pub. Serv. Co.	Station B	8,000	.....	.....
Texas Pwr. & Lt. Co.....	Trinidad, Texas	35,000	.....	.....
West Texas Utilities Co...	Concho (San Angelo)	‡20,000	.....	.....
MOUNTAIN STATES				
Cent. Ariz. Lt. & Pwr. Co.	Phoenix, Ariz.	.....	15,000	.....
Dixie Pwr. Co.	Cedar City, Utah.	*‡1,050	.....	.....
Glacier County Elec. Lt. & Pwr. Co.	Browning, Mont.	*90	.....	.....
Highland Utilities Co.....	Springfield, Colo.	*‡100	.....	.....
New Mexico Pub. Serv. Co.	Taos, New Mexico	*‡375	.....	.....
The Western Pub. Serv. Co.	Las Animas, Colo.	*625	.....	.....
PACIFIC STATES				
City of Tacoma, Wash....	.....	.....	25,000	100,000
Mountain States Pwr. Co.	Coos Bay (North Bend, Ore.)	10,000	.....	.....
Portland General Elec. Co.	Sta. "L" (Portland)	35,000	.....	150,000
Puget Sound Pwr. & Lt. Co.	Shuffleton	40,000	.....	.....
So. Calif. Edison Co., Ltd..	Long Beach No. 3.	100,000	.....	800,00

Hydro-Electric Plants

Company	Station and Location	Added to Existing Plants, Kw.	New Plants, Kw.	Ultimate Capacity, Kw.
NEW ENGLAND STATES				
New England Pwr. Ass'n..	Fifteen-Mile Falls. (Lower develop.)	.....	140,000	140,000
Public Elec. Lt. Co. (Vt.).. Dec., 1929	Milton	.....	3,000	.....
Public Serv. Co. of New Hampshire	Great Falls	.....	2,600	.....
Western Mass. Companies Constituent Co.	Cobble Mountain (Granville, Mass.)	.....	25,000	.....
MIDDLE ATLANTIC STATES				
New York Pwr. & Lt. Corp.	Conklingville	.....	25,000	.....
New York Pwr. & Lt. Corp.	Spier Falls	42,500	.....	.....
Niagara, Lockport & Ontario Pwr. Co.	Lighthouse Hill	.....	7,500	.....
Paul Smith's Elec. Lt. & Pwr. & R.R. Co.	Keeses Mills, N. Y.	.....	120	.....
Paul Smith's Elec. Lt. & Pwr. & R.R. Co.	Lake Placid, N. Y.	.....	250	.....
EAST NORTH CENTRAL STATES				
Wisconsin Hydro Elec. Co.	Eau Galle	.....	300	.....
Wisconsin Hydro Elec. Co.	Huntington	.....	400	.....
WEST NORTH CENTRAL STATES				
Empire District Elec. Co..	Ozark Beach, Mo.	5,000	.....	.....
Interstate Pwr. Co. of Neb.	Long Pine, Neb.	.....	150	150
Interstate Pwr. Co. of Neb.	Minnechaduza, Neb.	200	.....	350
SOUTH ATLANTIC STATES				
Carolina Pwr. & Lt. Co...	Waterville, N. C. (Pigeon River)	.....	108,000	.....
Crisp County Pwr. Plant..	Cordele, Ga.	.....	‡9,600	‡18,200
Florida Pwr. Corp.	Jackson Bluff, Fla.	.....	8,800	.....
Lexington Wtr. Pwr. Co...	Saluda River	.....	130,000	.....
Virginia Elec. & Pwr. Co..	Locks (Petersburg, Va.)	.....	(a) 2,500	.....
Virginia Public Service Co., (Leased from Hydro Elec. Corp. of Va.)	Cushaw (Snowden, Va.)	.....	7,500	7,500
EAST SOUTH CENTRAL STATES				
Alabama Pwr. Co.	Lower Tallassee	50,000	.....	.....
Kentucky Utilities Co....	Dix Dam	15,000	.....	.....
MOUNTAIN STATES				
Montana Pwr. Co.	Marony	.....	45,000	.....
Salt River Valley Water Users' Association	Stewart Mountain.	.....	13,000	13,000
PACIFIC STATES				
City of Centralia, Wash...	Near Yelm	.....	10,000	.....
City of Tacoma, Wash....	Lake Cushman No. 2	.....	55,500	112,500
Eugene Municipal Electric System	Leaburg	.....	(a) 7,500	(a) 15,000
Pacific Gas & Elec. Co. (Inc. Gt. Western Pwr. Co. & San Joaquin Lt. & Pwr. Co.)	Merced Falls	.....	3,440	.....
Portland Gen. Elec. Co....	Oak Grove (Port'd)	25,500	.....	76,500
So. Calif. Edison Co., Ltd..	Big Creek No. 3.	10,000	.....	120,000

*Oil or Diesel. ‡Horsepower. (a) Kilovolt-amperes.

Ten Years' Growth in Public Utility Power Plant Capacity in the United States*

(United States Geological Survey)

Division and State	January 1, 1920 Operating Companies	January 1, 1920 Plants	January 1, 1920 Capacity of Generators (Kilowatts)	January 1, 1929 Operating Companies	January 1, 1929 Plants	January 1, 1929 Capacity of Generators (Kilowatts)	January 1, 1930 Operating Companies	January 1, 1930 Plants	January 1, 1930 Capacity of Generators (Kilowatts)
UNITED STATES	2,955	4,283	13,093,972	1,720	3,795	29,629,702	1,628	3,780	31,952,396
New England	211	390	1,416,020	173	329	2,556,095	159	321	2,650,662
Middle Atlantic	419	610	3,484,807	197	424	7,406,027	164	413	7,866,813
East North Central	681	965	2,886,761	333	705	6,754,252	319	697	7,563,023
West North Central	568	739	1,097,555	371	691	2,068,058	366	704	2,216,326
South Atlantic	333	436	1,317,004	200	433	3,754,343	189	429	3,882,717
East South Central	172	222	553,647	91	222	1,497,282	88	214	1,563,046
West South Central	267	333	363,580	146	434	1,238,618	139	432	1,427,688
Mountain	182	308	708,796	131	281	972,795	131	290	1,110,058
Pacific	122	280	1,265,802	78	276	3,382,232	73	280	3,672,063

*In addition to central stations for electric light and power this table includes plants for electric railway operation and others generating electric power for public utility purposes. Plants of less than 100 kw. are omitted, as are the companies operating them.

Central Station Customers

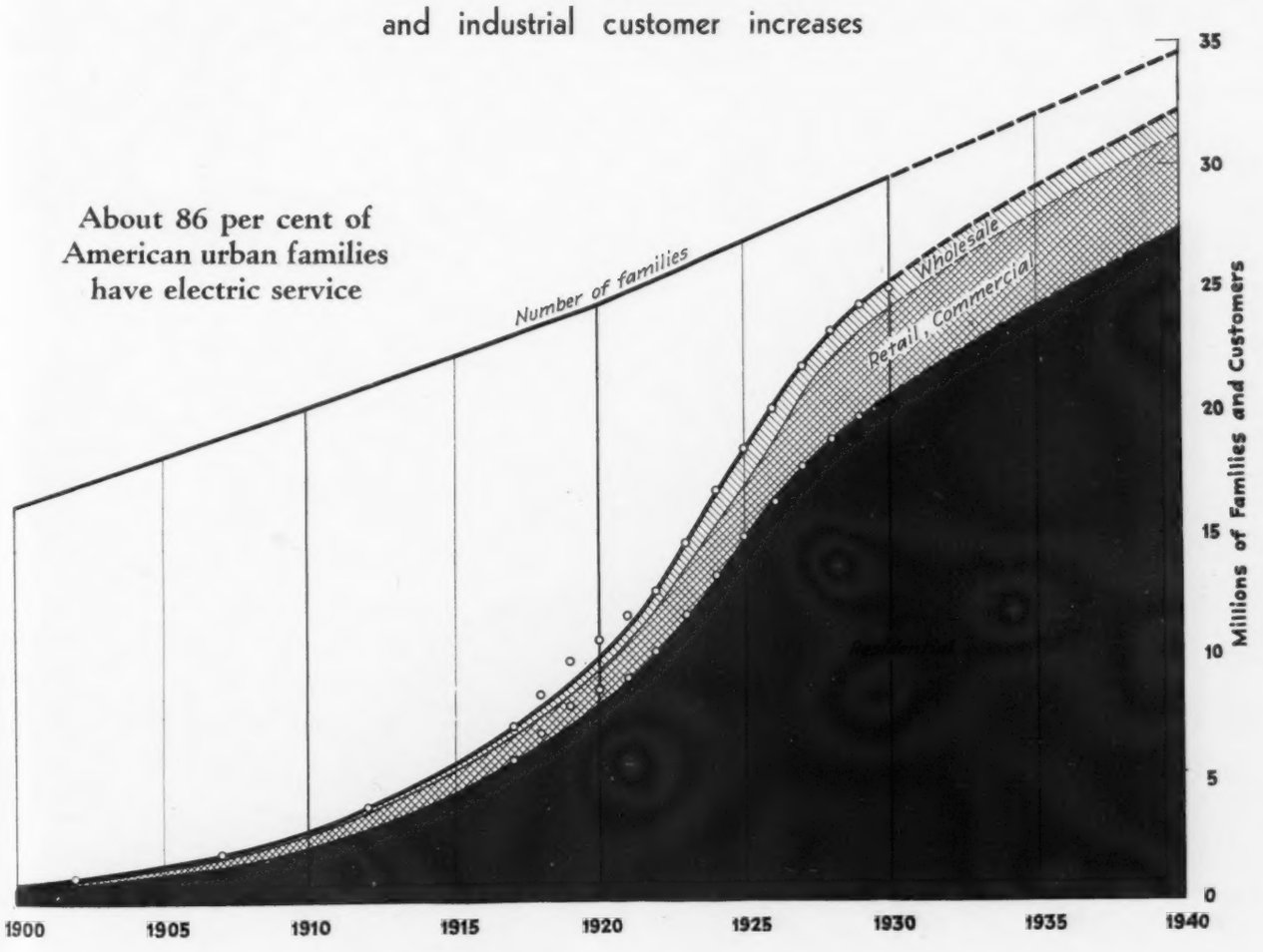
	Total Number				Domestic Lighting				Commercial Lighting and Small Power				Wholesale Power and Miscellaneous*			
	1928	1929	1930	Increase in 1930	1928	1929	1930	Increase in 1930	1928	1929	1930	Increase in 1930	1928	1929	1930	Increase in 1930
UNITED STATES	23,153,252	24,147,183	24,701,972	554,789	19,089,882	19,967,154	20,438,774	471,620	3,532,489	3,598,115	3,663,946	65,831	530,881	581,914	599,252	17,338
New England	2,115,380	2,183,205	2,245,474	62,269	1,742,377	1,809,850	1,863,438	53,588	338,941	335,037	344,186	9,149	34,062	38,318	37,850	—468
Middle Atlantic	6,466,856	6,730,993	6,913,227	182,234	5,427,400	5,677,480	5,832,934	155,454	945,134	955,297	973,433	18,136	94,322	98,216	106,860	8,644
East North Central	5,587,893	5,825,550	5,905,730	80,180	4,730,578	4,960,210	5,027,905	67,695	789,688	794,014	804,411	10,397	67,627	71,326	73,414	2,088
West North Central	2,268,430	2,336,958	2,386,097	49,139	1,866,563	1,921,563	1,965,472	43,909	347,570	354,387	362,531	8,144	54,297	61,008	58,094	—2,914
South Atlantic	1,689,151	1,782,337	1,843,406	61,069	1,385,594	1,466,003	1,512,251	46,248	280,191	291,767	306,921	15,154	23,366	24,567	24,234	—333
East South Central	781,694	830,461	853,109	22,648	621,139	659,615	680,695	21,080	148,270	155,679	156,378	699	12,285	15,167	16,036	869
West South Central	1,245,517	1,319,707	1,343,522	23,815	962,594	1,022,452	1,047,798	25,346	225,147	239,033	238,006	—1,027	57,776	58,222	57,718	—504
Mountain	627,391	652,537	651,612	—925	482,937	499,533	498,485	—1,048	98,950	99,981	98,959	—1,048	45,504	53,023	54,168	1,145
Pacific	2,370,940	2,485,435	2,559,795	74,360	1,870,700	1,950,448	2,009,796	59,348	358,598	372,920	379,121	59,348	141,642	162,067	170,878	8,811
NEW ENGLAND																
Maine	193,846	192,480	200,491	8,011	147,706	146,775	153,659	6,884	39,759	38,928	40,265	1,337	6,381	6,777	6,567	—210
New Hampshire	114,403	117,557	123,066	5,509	98,629	100,986	105,693	4,707	12,678	13,212	13,985	773	3,096	3,359	3,388	29
Vermont	76,668	78,177	78,918	741	59,352	60,752	61,504	752	14,598	14,707	14,716	9	2,718	2,718	2,698	—20
Massachusetts	1,142,389	1,190,853	1,223,765	32,912	959,384	1,007,384	1,037,521	30,137	170,837	167,937	170,454	2,517	12,168	15,532	15,790	258
Rhode Island	178,745	186,054	192,703	6,649	153,646	159,372	163,755	4,383	20,999	22,582	25,353	2,771	4,100	4,100	3,595	—505
Connecticut	409,329	418,084	426,531	8,447	323,660	334,581	341,306	6,725	80,070	77,671	79,413	1,742	5,599	5,832	5,812	—20
MIDDLE ATLANTIC																
New York	3,444,921	3,586,967	3,648,263	61,296	2,914,708	3,043,398	3,099,618	56,220	506,997	519,557	523,999	4,442	23,216	24,012	24,646	634
New Jersey	1,055,563	1,119,869	1,167,024	47,155	863,560	923,794	964,616	40,822	150,982	153,982	159,127	5,145	41,021	42,093	43,281	1,188
Pennsylvania	1,966,372	2,024,157	2,097,940	73,783	1,649,132	1,710,288	1,768,700	58,412	287,155	281,758	290,307	8,549	30,085	32,111	38,933	6,822
EAST NORTH CENTRAL																
Ohio	1,450,869	1,530,807	1,556,128	25,321	1,243,497	1,318,520	1,340,753	22,233	184,005	188,226	192,424	4,198	23,367	24,061	22,951	—1,110
Indiana	661,061	686,926	721,818	34,892	564,583	585,696	613,349	27,653	88,695	92,406	96,430	4,024	7,783	8,824	12,039	3,215
Illinois	1,830,270	1,880,687	1,872,478	—8,209	1,530,185	1,589,429	1,586,241	—3,188	280,083	270,033	265,479	—4,554	20,002	21,225	20,758	—467
Michigan	1,053,691	1,105,874	1,115,073	9,199	895,835	943,465	950,637	7,172	154,291	158,621	160*507	1,886	3,565	3,788	3,929	141
Wisconsin	592,002	621,256	640,233	18,977	496,478	523,100	536,925	13,825	82,614	84,728	89 571	4,843	12,910	13,428	13,737	309
WEST NORTH CENTRAL																
Minnesota	467,084	474,254	481,639	7,385	390,037	393,887	401,210	7,323	62,311	64,236	63,150	—1,086	14,736	16,131	17,279	1,148
Iowa	452,095	461,027	476,007	14,980	365,611	374,659	386,852	12,193	77,455	77,283	80,229	2,946	9,029	9,085	8,926	—159
Missouri	645,392	665,332	668,201	2,869	540,061	555,107	558,780	3,673	93,386	94,421	94,283	—138	11,945	15,804	15,138	—666
North Dakota	64,157	66,396	68,071	1,675	48,872	50,567	52,089	1,522	13,073	13,420	13,554	134	2,212	2,409	2,428	—19
South Dakota	83,424	84,182	86,296	2,114	64,086	64,753	66,059	1,306	16,414	16,414	17,074	660	2,924	3,015	3,163	148
Nebraska	229,369	241,693	249,198	7,505	192,404	202,027	209,428	7,401	32,880	34,764	36,210	1,446	4,085	4,902	3,560	—1,342
Kansas	326,909	344,074	356,685	12,611	265,492	280,563	291,054	10,491	52,051	53,849	58,031	4,182	9,366	9,662	7,600	—2,062
SOUTH ATLANTIC																
Delaware	40,231	43,370	45,817	2,447	32,074	34,864	36,811	1,947	7,720	8,023	8,443	420	437	483	563	80
Maryland																
Dist. of Columbia	412,881	443,128	454,545	11,417	347,105	376,548	386,793	11,245	63,942	64,709	64,763	54	1,834	1,871	1,989	118
Virginia	224,053	240,506	262,492	21,986	194,057	208,648	221,121	12,473	25,642	27,215	36,664	9,449	4,354	4,643	4,707	64
West Virginia	180,428	193,693	201,842	8,149	134,127	145,893	152,591	6,698	42,952	44,489	45,861	1,372	3,349	3,311	3,390	79
North Carolina	234,768	246,706	252,242	5,536	187,676	196,549	201,405	4,856	42,197	45,048	46,329	1,281	4,895	5,109	4,508	—601
South Carolina	115,409	119,208	124,754	5,546	92,411	95,801	99,841	4,040	22,114	22,114	23,785	1,671	884	1,293	1,128	—165
Georgia	224,868	237,270	249,108	11,838	183,595	193,803	203,023	9,220	40,041	42,293	44,852	2,559	1,232	1,174	1,233	59
Florida	256,513	258,456	252,606	—5,850	214,549	213,897	209,666	—4,231	35,583	37,876	36,224	1,652	6,381	6,683	6,716	33
EAST SOUTH CENTRAL																
Kentucky	269,559	285,467	297,404	11,937	216,005	229,253	238,241	8,988	49,986	51,212	53,529	2,317	3,568	5,002	5,634	632
Tennessee	235,779	250,401	254,659	4,258	187,166	198,691	203,573	4,882	42,428	45,273	44,253	—1,020	6,185	6,437	6,833	396
Alabama	182,750	191,559	192,839	1,280	145,341	151,677	154,586	2,909	36,233	38,711	36,645	—2,066	1,176	1,171	1,608	437
Mississippi	93,606	103,034	108,207	5,173	72,627	79,994	84,295	4,301	19,623	20,483	21,951	1,468	1,356	2,557	1,961	—596
WEST SOUTH CENTRAL																
Arkansas	125,348	133,693	134,523	830	90,142	96,110	97,747	1,637	29,028	30,684	30,930	246	6,178	6,899	5,846	—1,053
Louisiana	176,779	187,862	192,548	4,686	140,580	150,039	156,045	6,006	30,129	30,418	29,125	—1,293	6,070	7,405	7,378	—27
Oklahoma	274,413	298,144	309,029	10,885	208,852	225,959	233,085	7,126	48,678	52,633	54,040	1,407	16,883	19,552	21,904	2,352
Texas	668,977	700,008	707,422	7,414	523,020	550,344	560,921	10,577	117,312	125,298	123,911	—1,387	28,645	24,366	22,590	—1,776
MOUNTAIN																
Montana	84,677	87,186	84,822	—2,364	63,058	64,158	66,311	2,153	19,312	19,766	15,382	—4,384	2,307	3,262	3,129	—133
Idaho	81,448	85,005	83,098	—1,907	53,394	54,063	53,153	—910	16,194	15,886	14,123	—1,763	11,860	15,056	15,822	766
Wyoming	32,748	34,970	36,354	1,384	26,970	28,970	29,761	791	4,746	4,813	5,377	564	1,032	1,187	1,216	29
Colorado	204,652	208,752	211,240	2,488	159,791	163,344	164,737	1,393	30,815	29,735	31,435	1,700	14,046	15,673	15,068	—605
New Mexico	30,196	32,673	34,780	2,107	24,229	26,197	27,180	983	4,662	4,814	5,379	565	1,305	1,662	2,221	559
Arizona	61,192	68,124	70 677	2,553	49,502	55,505	57,524	2,019	9,316	10,182	10,998	816	2,374	2,437	2,155	—282
Utah	116,213	118,171	110,655	—7,516	93,440	94,296	85,505	—8,791	12,212	12,312	13,167	855	10,561	11,563	11,983	420
Nevada	16,265	17,656	19,986	2,330	12,553	13,000	14,314	1,314	1,693	2,473	3,098	625	2,019	2,183	2,574	391
PACIFIC																
Washington	421,033	443,402	454,702	11,300	320,740	335,947	342,030	6,083	57,794	60,685	59,673	—1,012	42,499	46,770	52,999	6,229
Oregon	224,073	234,679	240,564	5,885	176,947	183,488	187,235	3,747	34,942	36,373	34,121	—2,252	12,184	14,818	19,208	4,390
California	1,725,834	1,807,354	1,864,529	57,175	1,373,013	1,431,013	1,480,531	49,518	265,862	275,862	285,327	9,465	86,959	100,479	98,671	—1,808

*Because of reclassifications the data on wholesale customers, and to a less degree data on retail customers, are not comparable with statistics in similar tables previously published. Reclassifications also account for apparent shrinkages or abnormally small gains reported by certain companies and reflected in state totals.

Half a Million New Customers

Rate of increase slowing down to that of increase in number of families. Rural customers added at rapid rate. Depression has effect on commercial and industrial customer increases

About 86 per cent of American urban families have electric service



ADDITIONS during 1930 have brought the total number of electric light and power customers to 24,702,000; most of these, 82.8 per cent, are residential, 14.8 are retail commercial and 2.4 per cent wholesale. Net additions during the year were 554,800, distributed in virtually the same ratios as the total number.

The unfavorable industrial situation did not result in a decrease, but it did keep down the increase. Where normally an addition exceeding 800,000 domestic customers might have been anticipated, there were 471,620.

Urban communities have been largely electrified. There are in the United States some 29,300,000 families; 6,300,000 are on farms; the exact number of these having electric service is somewhat uncertain, but may be taken at roughly 10 per cent. In contrast, of the remaining 23,000,000 families, those not living on farms, perhaps 19,850,000 are light and power customers—86 per cent. Included among the latter are not only the dwellers in cities and towns but those in small villages. For the larger places the percentage is probably higher.

The influence of local conditions is evident in the per

cent of increase during the year of domestic customers by geographical regions, as follows:

New England	2.96	East South Central	3.19
Middle Atlantic	2.74	West South Central	2.48
East North Central	1.36	Mountain	—2.10
West North Central	2.28	Pacific	3.05
South Atlantic	3.15	United States	2.36

In certain states a net loss of commercial customers, both wholesale and retail, is indicated. In others the increase is smaller than might seem reasonable. During 1928 the addition in these two classes, combined, including a scattering of miscellaneous customers, was 116,659; in 1930 it was 83,169. In some localities losses undoubtedly occurred; in part, the apparent losses, or reduced increments, are due to reclassifications, presumably including consolidation of several services to the same consumer formerly metered and billed separately. How much of the change is to be ascribed to each of these influences cannot be ascertained.

Diversity of practice in defining the distinction between wholesale and retail commercial customers makes the dividing line vague. The figures must therefore be interpreted with this uncertainty borne in mind.

The increase in the whole number of customers is the smallest in many years. During 1929 it was close to 1,000,000; in the five-year period from 1912 to 1917, when the industry was only a quarter as large as it is now, the average annual increase was 660,000. In that day home electrification was rapidly increasing. In 1912 only 16 per cent of our population lived in electrically lighted homes; by 1917 they had increased to 24.3 per cent; thirteen years ago, therefore, three-fourths of the people were still potential rather than actual customers; many were neighbors, in populous centers, of families having electric light; in addition, the effect of the normal growth in population was to be considered.

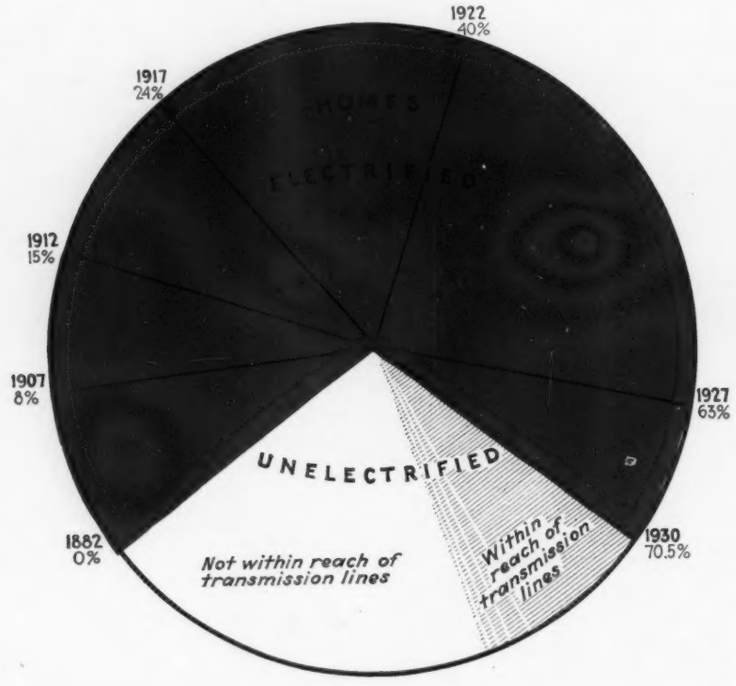
The most rapid growth came in the middle years of the past decade. From 1922 to 1927 domestic customers, by far the predominant class, came on at the rate of 1,500,000 a year. This could not continue. In 1927 there were only 8,000,000 families left unserved. Many of them were in localities or on an economic level that for some time to come excludes them from consideration. The growth curve had to flatten, and it did.

By 1940, 5,000,000 families will have been added to our population. Adding the same number of domestic customers will merely keep up with that increase. Based on past growth and on the trend with reference to population the total number of residential customers should by 1940 be around 28,000,000. This implies an additional gain during the decade of 2,500,000, of whom several hundred thousand will simply be the belated accessions normally belonging to 1930. The total increase to be reasonably anticipated is thus 7,500,000. To these may be added a proportionate increase in retail light and power, and a smaller in wholesale. Urban electrification achieved, rural must gradually follow.

Tabulation by states and by classes

The number of customers by states, in the accompanying table, is based on the 1927 census of the industry. The latter statistics include a large number undistributed by class of service. These have been allocated in the light of other information.

Because of the changes in allocation previously mentioned some of the data are not strictly comparable with those in similar tables published in earlier years. The revision affects chiefly the statistics for wholesale customers. For the three years here tabulated the figures are believed faithfully to reflect the growth that has occurred, subject to qualifications imposed by company changes in classification.



Rural customers next in order

Utility Mergers Decreasing

Trend toward fewer holding companies and decentralized operating companies. Purchase of small units and merging of large groups major activity in the past year

IN THE decade from 1910 to 1920 the light and power industry grew as a multitude of local properties that expanded and intensified their local service. Only the germs of the holding company and regional groupings were evident. But from 1920 to 1930 the industry consolidated rapidly into large units. This move was started for financial reasons in that diversity in holdings and a unit large corporation had a better chance to establish a credit position. Soon, however, the economies inherent in grouping steam and hydro plants in a region and connecting them with widespread transmission lines led to the development of regional power supplies. The initial holding company objective was to get many widely separated properties to stabilize earnings. The final movement was an attempt also to get the least expensive and best power supply for a large territory. Thus the 1920 to 1930 decade witnessed a rapid amalgamation of properties into groups. Each group was formed under different conditions and usually had a corporate name and financial structure developed by the commercial and legal expediencies of each situation. The peak of this movement has passed.

During the next decade undoubtedly there will be a great number of mergers, consolidations and readjustments in ownership. These will be developed not only to give stability in earnings but also to get a logical and economical power supply for each territory. Parallel with these large property changes will be the absorption of small properties by purchase, the selling of energy to small towns for local distribution and the formation of organization and installation methods that have more uniformity and are more efficient.

A very large proportion of holding companies will no doubt be consolidated or absorbed to form logical holding units. How rapidly this is done depends upon security markets and the influence of legal technicalities connected with securities already issued. In a fundamental conception each logical and economical power supply area will have a responsible operating management that will report to a holding company or counsellor management that handles financing and policy problems for a group of similar operating managements. This type of organization has proved to be needed and effective.

But the area for an operating management to serve is limited. It has been found in the light and power industry, as in the telephone industry, that an operating property must be rather restricted to be effective—a management must be close to the customers and to the operations. For example, one management might well operate the lightly loaded state of Montana, but this would not be feasible in New York or in Pennsylvania. While the trend is toward a state operating

Top Holding Companies—January 1, 1931

American Commonwealths Power Corp.
American Electric Power Corp.
American Gas & Electric Co.
American Power & Light Co.
American Water Works & Electric Co.
Associated Gas & Electric Co.
Central Public Service Co.
Central West Public Service Co.
Cities Service Co.
Columbia Gas & Electric Corp.
Commonwealth & Southern Corp.
Consolidated Gas Co. of New York
Eastern States Public Utilities, Inc.
Electric Power & Light Corp.
Empire Public Service Corp.
General Utilities & Operating Co.
General Water Works & Electric Corp.
Massachusetts Utilities Associates
Middle West Utilities Co.
Midland United Company
Minnesota Northern Power Co.
National Power & Light Co.
Nevada-California Electric Corp.
New England Power Association
New England Water, Lt. & Pwr. Asso.
Niagara Hudson Power Corp.
North American Gas & Electric Co.
North American Light & Power Co.
North Boston Lighting Properties
North Continent Utilities Corp.
Pacific Lighting Corp.
Peoples Light & Power Corp.
Public Service Corp. of New Jersey
Standard Power & Light Corp.
Stone and Webster, Inc.
United Light & Power Co.
Utilities Power & Light Corp.
Western Massachusetts Companies
Western Power, Light & Telephone Co.
Western United Corp.

Holding Company Mergers and Acquisitions, 1930

Acquiring Company	*Company Involved*
AMERICAN COMMONWEALTHS POWER CORP.	
	Canadian interests of International Utilities Corp.
CENTRAL PUBLIC SERVICE CORP.	
	Southern Cities Utilities Co.
COMMONWEALTH & SOUTHERN CORP.	
	(*M*) Allied Power & Light Corp.
	(*M*) Commonwealth Power Corp.
	(*M*) Penn-Ohio Edison Co.
	(*M*) Southeastern Power & Light Co.
CITIES SERVICE CO.	
	(*C*) Federal Light & Traction Co. (March, 1930)
EASTERN STATES PUBLIC UTILITIES, INC.	
	(*C*) Atlantic Public Utilities, Inc.
MIDDLE WEST UTILITIES CO.	
	Commonwealth Light & Power Co. (formerly affiliated, now subsidiary)
	(*C*) Kentucky Securities Corp., holdings of International Utilities Corp.
NEW ENGLAND POWER ASSOCIATION	
	Massachusetts Utilities Associates (C. D. Parker Group)
NIAGARA HUDSON POWER CORP.	
	(*C*) Eastern Gas & Electric Securities Corp.
PUBLIC UTILITY HOLDING CORP.	
	Central West Public Service Co. (50% of voting stock)
	(*C*) Federal Light & Traction Co. (Dec., 1929
	(*C*) United States & Overseas Corp.
STONE & WEBSTER, INC.	
	(*C*) Engineers Public Service Co.
	(*C*) Sierra Pacific Electric Co.
UNITED STATES ELECTRIC POWER CORP. and H. M. BYLLESBY & CO.	
	(*C*) Standard Power & Light Corp.
STANDARD POWER & LIGHT CORP.	
	(*C*) Standard Gas & Electric Co.

(*M*) Merged. (*C*) Control.

territory for one management, there is little doubt that most of the industrial states should be served by two or more operating organizations, each with local authority and defined territorial limits and yet working in co-operation with adjacent organization.

In the development of a more or less uniform type of operating and holding company organization there are major problems. The best functional organization is not known, the definition of responsibility of local manager, holding company manager and holding company banker must be made more tangible. In commercial, engineering, accounting and operating organization aspects there are equally difficult decisions to make. But logic points to the development of large holding or management corporations fewer in number than those now existing. The decentralized operating organizations will be responsible for service territories whose boundaries are fixed by engineering and economic factors to give the best service at maximum efficiency.

During 1930 very few large corporate changes occurred. The business depression and other elements slowed up the movement toward consolidation and revamping of large units. The Commonwealth & Southern Corporation completed its program of merging the Allied Power & Light Corporation, Commonwealth Power Corporation, Penn-Ohio Edison Company and Southeastern Power & Light Company into the parent organization. The Cities Service Company acquired control of the Federal Light & Traction Company, previously held by the Public Utility Holding Corporation. Stone & Webster, Inc., acquired controlling interest in its affiliates Engineers Public Service Company and Sierra Pacific Electric Company.

One of the big moves in the industry was the development whereby the United States Electric Power Corporation and H. M. Byllesby & Company acquired control of the Standard Power & Light Corporation, which controls the Standard Gas & Electric Company. Other minor acquisitions were made by other major holding corporations. One receivership is found in a small holding company called the Atlantic Public Utilities. The end of the year finds the several large holding groups strengthened largely by the acquisition of small towns in the territories of operating properties.

A glance at operating properties finds that, in comparison to previous years, few changes in ownership

Utility Mergers and Purchases in 1930

(See also Municipal Systems Absorbed)

New England States

NEW HAMPSHIRE

Acquiring Company	*Company Involved*	*Holding Company*
New England Power Association	Salem Electric Light Co.	..
New England Public Service Co.	Groveton Electric Light Co. Lyman Falls Power Co.	29
Salem Electric Light Co.	Hampshire Roads Electric Co. F. D. Tootell Electric Co.	26

VERMONT

New England Power Association	Wilmington Electric Light Co.	..

MASSACHUSETTS

New England Gas & Electric Ass'n.	(*C*) New Bedford Gas & Edison Light Co. (Dec., 1929)	7
Western Counties Electric Co. (formerly Leverett Electric Co.)	(*M*) Amherst Gas Co. (Electric Dept.) (*M*) Easthampton Gas Co. (Electric Dept.) (*M*) Hampshire Electric Co.	49

CONNECTICUT

The Connecticut Electric Service Co.	The Rockville-Willimantic Ltg. Co.	48

Middle Atlantic States

NEW YORK

Acquiring Company	*Company Involved*	*Holding Company*
Elmira Water, Light & Railroad Co.	(*M*) Beaver Dams Light Co., Inc.	34
Empire Gas & Electric Co.	(*M*) Jordon Electric Light & Power Co. (*M*) Marcellus Lighting Co.	34
Long Island Lighting Co.	(*M*) Long Island Gas Corp. (*M*) Public Service Corp. of L. I. (*M*) Sag Harbor Elec. Light & Power Co.	..
Malone Light & Power Co.	(*M*) Fort Covington Lt., Heat & Pwr. Co. (*M*) Milling & Ltg. Co. (Brasher Falls)	40
New York State Elec. & Gas Corp.	Binghamton Lt., Heat & Pwr. Co. Lockport Light, Heat & Power Co. Vestal Lighting Co. Wayland Light & Power Co. (all as of Oct., 1929)	34
Niagara Hudson Power Corp.	Central Hudson Gas & Electric Corp. (30% of Com. Stock) Union Bag & Paper Power Corp. (Purchase of all Com. Stock)	..
Queens Borough Gas & Electric Co.	Long Beach Power Co.	27
Westchester Lighting Co.	(*M*) Northern Westchester Lighting Co. (Nov., 1929) (*M*) Peekskill Lighting & Railroad Co. (Nov., 1929)	17

PENNSYLVANIA

Acquiring Company	*Company Involved*	*Holding Company*
Pennsylvania Electric Co.	Isolated group of properties in Pennsylvania formerly controlled by Penn Central Light & Power Co. Rockwood Electric Co.	6
Pennsylvania Power Co.	(*M*) Harmony Electric Co. (*M*) Pennsylvania Power Co. (*M*) Peoples Power Co.	16
National Electric Power Co.	Newburg Electrical Co.	28
West Penn Power Co.	(*C*) (*M*) Boalsburg Electric Co. (*C*) (*M*) Centre Electric Co.	50a

East North Central States

OHIO

Associated Gas & Electric Co.	New Matamoras Electric Co.	..
Central Ohio Light & Power Co.	Enterprise Utilities Co. of Toledo Farmers Light & Power Co. of Venedocia North Baltimore Service Co. Rudolph Light & Power Co. Toledo Bowling Green & Southern Traction Co. Western Ohio Railway & Power Co. Wooster Electric Co.	23

KEY TO HOLDING, CONTROLLING, MANAGEMENT AND SUPERVISORY COMPANIES

1 American Commonwealths Power Co.
2 American Community Power Co. (Del.) (1)
2a American Electric Power Corp.
3 American Gas & Electric Co.
4 American Power & Light Co. (21)
5 American Water Works & Electric Co., Inc.
6 Associated Electric Co. (7)
7 Associated Gas & Electric Co. (51)
9 Byllesby Engineering & Management Corp. (46)
10 Central Gas & Electric Co. (12)
11 Central Public Service Co.
12 Central Public Service Corp. (11)
13 Cities Service Co. (18)
14 Central & South West Utilities Co. (28)
15 Commonwealth Light & Power Co. (28)
16 Commonwealth & Southern Corp.
16a Community Power & Light Co. (Del.)
17 Consolidated Gas Co. of New York
18 H. L. Doherty & Co. (13) (Fiscal agent for Cities Service Co. and Subsidiaries)
19 Duke Power Co.
20 Eastern States Public Utilities, Inc.
21 Electric Bond & Share Co. (Supervisory, 4, 22, 30)
22 Electric Power & Light Corp. (21)
23 Empire Public Service Corp.
24 Engineer's Public Service Co. (47)
25 General Water Works & Electric Corp.
26 Hill Light & Power Co.
27 Long Island Lighting Co.
28 Middle West Utilities Co.
29 National Electric Power Co. (28)
30 National Power & Light Co. (21)
31 National Public Service Corp. (29)
34 New York Electric Co. (6)
35 Niagara Hudson Power Corp.
36 The North American Co.
37 North American Edison Co. (36)
39 Northern States Power Co. of Delaware (46)
39a Peoples Light & Power Corp.
40 Power & Electric Securities Corp. (41)
41 Power Corporation of New York (35)
43 Seaboard Public Service Co. (31)
44 Sierra Pacific Electric Co. (47)
45 Southwestern Power & Light Co. (4)
46 Standard Power & Light Corp. (9)
47 Stone & Webster, Inc.
48 United Gas Improvement Co.
49 Western Massachusetts Companies
50 Western Power, Light & Telephone Co.
50a West Penn Electric Co. (5)
51 The J. G. White Management Corp. (7)

Utility Mergers and Purchases in 1930 (Continued)

Acquiring Company	*Company Involved*	*Holding Company*
OHIO EDISON CO.		16
	(*M*) The Akron Steam Heating Co.	
	(*M*) The London Light & Power Co.	
	(*M*) Northern Ohio Power & Light Co.	
	(*M*) The Ohio Edison Co.	
	(*M*) Ohio River Edison Co.	
	(*M*) The Pennsylvania-Ohio Pwr. & Lt. Co.	
OHIO ELECTRIC POWER CO.		29
	(*M*) Ansonia Light Co.	
	(*M*) Citizens Light & Power Co.	
	(*M*) Rockford Light & Power Co.	
UTILITIES POWER & LIGHT CORP.		
	(*O*) Alliance Utils. Service Co.	
INDIANA		
MIDLAND UNITED CO.		
	Cambridge Light & Power Co.	
	Liberty Light & Power Co.	
SOUTHERN INDIANA GAS & ELECTRIC CO.		16
	The Boonville Elec. Light & Power Co.	
	Newburgh Light & Water Co.	
ILLINOIS		
ROCKFORD ELECTRIC CO.		10
	Davis Junction Electric Co.	
MICHIGAN		
COMMONWEALTH LIGHT & POWER CO.		28
	(*C*) Michigan Public Service Co.	
CONSUMERS POWER CO.		16
	(*M*) Southern Michigan Light & Power Co.	
CONSUMERS POWER CO.		16
	Electric companies and/or distribution systems:	
	Addison Barryton	
	Centerville (hydro plant and distribution)	
	Collier Light & Power Co., Saranac	
	Homer Leroy Tustin Palo Weidman	
INDIANA & MICHIGAN ELECTRIC CO.		3
	Hartford Light & Power Co.	
WISCONSIN		
NORTHERN STATES POWER CO.		39
	Dells Paper & Pulp Co.	

South Atlantic States

MARYLAND

MARYLAND LIGHT & POWER CO.		23
	Antietam Electric Light & Power Co.	
	Betterton Ice & Electric Co.	
	Cecilton Electric Light & Power Co.	
	Emmitsburg Electric Co.	
	Home Electric Light Co.	
	Leonardtown Ice & Power Co.	
	Love Point Light & Power Co.	
	Maryland East Coast Utilities Co.	
	Midland Electric Light Co.	
	Millington Light & Power Co.	
	Somerset Electric Co.	
	Suburban Electric Power Co.	
	Trappe Electric Light Co.	
VIRGINIA		
AMERICAN CONSTRUCTION & SECURITIES CO.		5
	(*C*) Warren Power Co.	
APPALACHIAN ELECTRIC POWER CO.		3
	Tazewell Electric Light & Power Co.	
ATLANTIC PUBLIC UTILITIES, INC.		20
	Shenandoah River Power Co.	
MONONGAHELA SECURITIES CO.		5
	Monterey Garage & Light Co.	
VIRGINIA ELECTRIC & POWER CO.		24
	(*M*) City Gas Co. of Norfolk properties	
	Leased electric property of Norfolk & Southern Railroad	
WEST VIRGINIA		
APPALACHIAN ELECTRIC POWER CO.		3
	Athens Power Co.	
ASSOCIATED GAS & ELECTRIC CO.		
	West Virginia Light, Heat & Pwr. Co.	
RIDGELY LIGHT & POWER CO.		50*a*
	Valley Electric Co.	
WEST VIRGINIA PUBLIC SERVICE CO.		50*a*
	Campbell Electric Co. (Summersville)	
NORTH CAROLINA		
CAROLINA POWER & LIGHT CO.		30
	Haywood Electric Power Co.	
DUKE POWER CO.		
	Old Fort Power Plant	
	Lake Tahoma Power Plant	
SOUTHERN PUBLIC UTILITIES CO.		19
	Hillsboro Power & Light Co.	
	Welcome Light & Power Co.	
VIRGINIA ELECTRIC & POWER CO.		24
	Everetts Local Light Plant & Distributing System	
SOUTH CAROLINA		
QUATTLEBAUM LIGHT & ICE CO.		25
	Loris (electric property at)	
	Myrtle Beach (electric property at)	
GEORGIA		
GEORGIA POWER CO.		16
	Baker County Power Co.	
	Brooklet (distribution)	
	Columbus Electric & Power Co.	
	Georgia Hydro-Electric Co.	
	Hopeville (distribution)	
	Newton Light & Power Co.	
	Southeast Georgia Power Co.	
FLORIDA		
FLORIDA POWER & LIGHT CO.		
	Jefferson County Power Co.	
	Taylor County Power Co.	
TAMPA ELECTRIC CO.		47
	Auburndale Power Co.	

East South Central States

KENTUCKY

KENTUCKY-TENNESSEE LIGHT & POWER CO.		6
	Southern Ice & Utilities Co.	
TENNESSEE		
AMERICAN UTILITIES CO.		6
	Alamo Power & Light Co.	
	Crockett Mills Light Co.	
	Dover Power Co.	
	Maury City Electric Co.	
TENNESSEE ELECTRIC POWER CO.		16
	Hiwassee Light & Power Co.	
	Lynnville Light & Power Co.	
	Philadelphia (distribution)	
	Rockwood (distribution)	
	South Kentucky Power Co.	
ALABAMA		
ALABAMA POWER CO.		16
	Alabama properties of Georgia Pwr. Co.	
	Alabama properties of Southern Cities Power Co. and/or Public Light & Power Co.	
	Auburn-Alabama Polytechnic Institute Light Dept.	
	Bayou Light & Power Co.	
	Citronelle Light & Power Co.	
	Lockhart (acq. from Jackson Lumber Co.)	
	Mt. Vernon Ice & Light Co.	
	Pine Hill Ice & Power Co.	
ALABAMA UTILITIES CO.		25
	(*M*) Andalusia Light & Power Co.	
	(*M*) Opp Power & Light Co.	
	(*M*) Pea River Power Co.	
	(*M*) River Falls Power Co.	
GENERAL WATER WORKS & ELECTRIC CORP.		
	Alabama Utilities Co.	
MISSISSIPPI		
MISSISSIPPI POWER CO.		16
	Distribution systems and/or plants	
	Bassfield New Augusta	
	Bay Springs Pachuta	
	Decatur Purvis	
	Forest Quitman	
	Hickory Seminary	
	Leakesville Stringer	
	Louin Sumrall	
	Lucedale Waynesboro	
	Lumberton Wiggins	
	Montrose	
MISSISSIPPI POWER & LIGHT CO.		22
	Southwestern Gas & Electric Co.	
	Natchez plant (late 1929)	

West South Central States

OKLAHOMA

OKLAHOMA GAS & ELECTRIC CO.		46
	Earl W. Baker Utils. Co.	
PUBLIC SERVICE CO. OF OKLAHOMA		14
	Westville Electric Power Co. (December, 1929)	
TEXAS		
TEXAS ELECTRIC SERVICE CO.		45
	(*M*) Ft. Worth Power & Light Co. (late 1929)	
	Handley power plant and minor electric properties of Northern Texas Traction Co. and Tarrant County Traction Co.	

Mountain States

Acquiring Company	*Company Involved*	*Holding Company*
IDAHO		
WASHINGTON WATER POWER CO. (THE)		4
	Certain property (located in Idaho only) of	
	Inland Power & Light Co.	
	Kootenai Power Co.	
WYOMING		
MOUNTAIN STATES POWER CO.		46
	Buffalo Northwest Electric Co.	
	Lander Electric Light & Power Co.	
	Northwest Transmission Co.	
	Oil Fields Power Co.	
	Thermopolis Northwest Electric Co.	
	Wyoming Hydro Electric Co.	
COLORADO		
WESTERN POWER, LIGHT & TELEPHONE CO.		
	Home Gas & Electric Co.	
ARIZONA		
ARIZONA EDISON CO.		39*a*
	Superior Light & Power Co.	
NORTH CONTINENT UTILITIES CORP.		
	(*C*) Cochise Utilities Co.	
	(*C*) Willcox Power Co.	
UTAH		
NORTH AMERICAN GAS & ELECTRIC CO.		
	Dixie Power Co.	
NEVADA		
SIERRA PACIFIC POWER CO.		44
	Nevada Valleys Power Co.	

Pacific States

OREGON

CENTRAL PUBLIC SERVICE CORP.		11
	Portland Electric Power Co.; name changed to Pacific Northwest Public Service Co.	
NORTH AMERICAN GAS & ELECTRIC CO.		
	Oregon Gas & Electric Co.	
PACIFIC POWER & LIGHT CO.		4
	Acquired all stock and certain properties in Oregon of Inland P. & L.	
CALIFORNIA		
PACIFIC GAS & ELECTRIC CO.		
	Great Western Power Co. of California	
	Midland Counties Public Serv. Corp.	
	Novato Utilities Co.	
	San Joaquin Light & Power Corp.	
	Snow Mountain Water & Power Co.	

Canada

Acquiring Company	*Company Involved*
AMERICAN COMMONWEALTHS POWER CORP.	
	Canadian gas and electric properties of International Utilities Corp.
IOWA SOUTHERN UTILITIES CO.	
	Moose Jaw, Saskatchewan Municipal Light & Power Plant (now operated by National Light & Power Co., Ltd.)
MIDDLE WEST UTILITIES CO. OF CANADA, LTD.	
	National Utilities, Limited
MONTREAL LIGHT, HEAT & POWER CONSOLIDATED	
	City of St. Lambert electric lighting equipment
ONTARIO HYDRO-ELECTRIC POWER COMMISSION	
	Dominion Power & Transmission Co.
	Public Utilities Consolidated Corp. Properties:
	Saugeen Electric Light & Power Co.
	Saule Falls Power & Light Co.
	Western Electric Power & Light Co.
	(*C*) Wahnapitae Power Co., Ltd.
UTILITIES POWER & LIGHT CORP.	
	Maritime Coal, Ry. & Power Co., Ltd.

(*C*) Control. (*M*) Merged. (*O*) Operating management for three years.

Municipal Systems Absorbed in 1930

	Acquiring Company	*Holding Company*
Alabama		
Headland	Alabama Power Co	16
Colorado		
Paonia	Oliver Power Co	..
Florida		
Apalachicola	Florida Power Corp	43
Bramford	Florida Power Corp	43
Dunellon	Florida Power Corp	43
Georgia		
Hawkinsville	Georgia Power Co	16
Ludowici	Georgia Power Co	16
Washington	General Water Works & Elec. Corp (Will operate under name of Washington Water & Electric Co.)	..
Iowa		
Aurelia	Iowa Public Service Co	2a
Dow City	Iowa Public Service Co	2a
Everly	Northwestern Light & Power Co	..
Harcourt	Ft. Dodge Des Moines & Southern R.R. Co.	..
Pomeroy	Humboldt Electric Co	..
Kansas		
Almena	Kansas Power Co	26a
Elkhart	Kansas City Power & Light Co	..
Elwood	Doniphan County Public Service Co	..
Le Roy	Kansas Utilities Co	16a
Medicine Lodge	Western Light & Power Corp	50
White Cloud	White Cloud Electric Co	..
Maryland		
Princess Anne	Somerset Electric Co (Maryland Light & Power Co.)	23
Michigan		
Evart (distribution)	Consumers Power Co	..
Rose City	Northern Power Co	..
Mississippi		
Rolling Fork	Mississippi Power & Light Co	22
Missouri		
Gower	St. Joseph Railway, Light Heat & Power Co.	13
Nebraska		
Herman	Nebraska Power Co	4
North Bend	Nebraska Power Co	4
North Carolina		
Andrews	Nantahala Power & Light Co	..
Bailey	Carolina Power & Light Co	30
Boiling Springs	Southern Public Utilities Co	19
Ellenboro	Southern Public Utilities Co	19
Gibson	Carolina Power & Light Co	30
Franklin	East Coast Utilities Co	23
Lattimore	Southern Public Utilities Co	19
Monroe	Southern Public Utilities Co	19
Mooresboro	Southern Public Utilities Co	19
Nashville	Carolina Power & Light Co	30
Rutherfordton	Southern Public Utilities Co	19
Spindale	Southern Public Utilities Co	19
Oklahoma		
Beaver	Texas-Louisiana Power Co	25
Woodward	Western Light & Power Corp	50
Tennessee		
Lexington	Tennessee Electric Power Co	16
Virginia		
Waynesboro (Basic district)	Virginia Public Service Co	43
West Virginia		
Davis	Monongahela West Penn Public Service Co.	50a
Franklin	West Virginia Public Service Co	50a
Marlinton	West Virginia Public Service Co	50a
Wisconsin		
Port Washington	Milwaukee Electric Railway & Light Co	37

occurred. In each territory extensions made possible the acquisition of small towns. In this way 46 municipal properties were purchased and many more small privately owned companies. One of the most important changes was the Pacific Gas & Electric acquisition of the Great Western Power, Midland Counties and San Joaquin Light & Power. In return, the North American Company acquired a substantial interest in Pacific Gas & Electric. Portland Electric Power Company changed to Pacific Northwest Public Service Company, then formed Portland General Electric Company to handle the electric power and light portion.

The property changes in Mississippi were a follow-up upon the development of major generating and transmission networks. In each state property changes occurred that indicated a continuation of the growth of extended transmission systems to serve larger areas. In the operating group only one small company receivership is recorded—the West Virginia Light, Heat & Power Company, later acquired by Associated Gas & Electric Company. In one or two instances gas and electric operations of properties were separated to give more freedom to the development of each service.

During 1931 small property acquisitions will continue to be made and some major holding company readjustments and mergers are anticipated. How rapidly these occur depends upon the general financial situation during the year.

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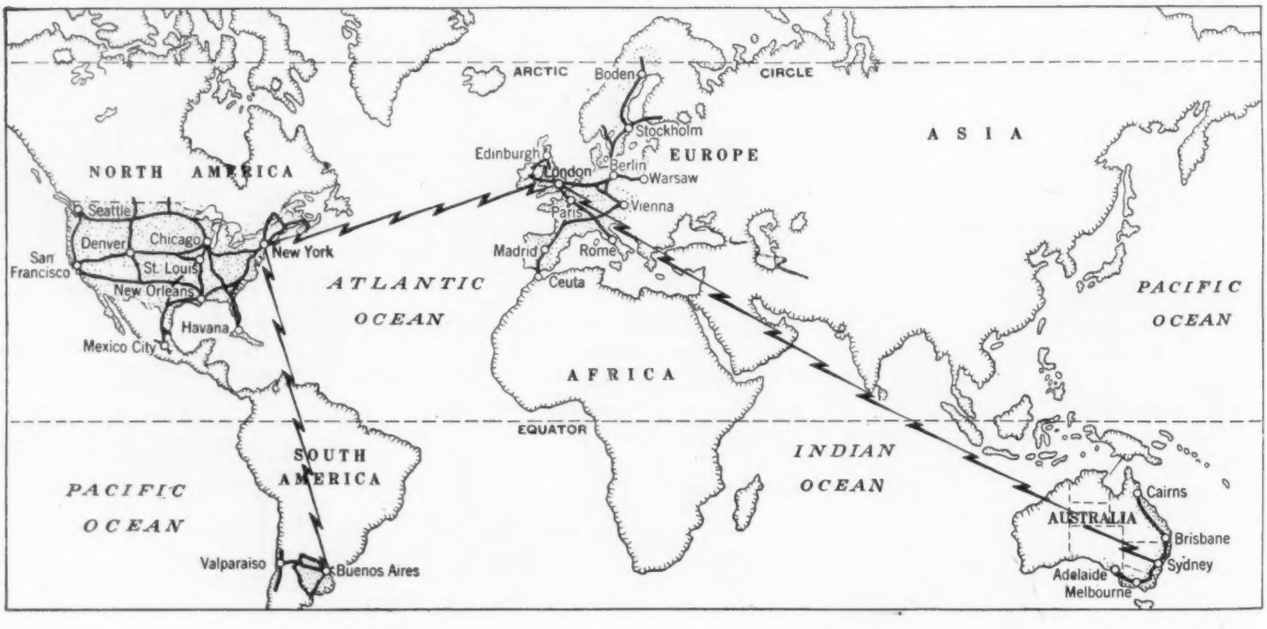
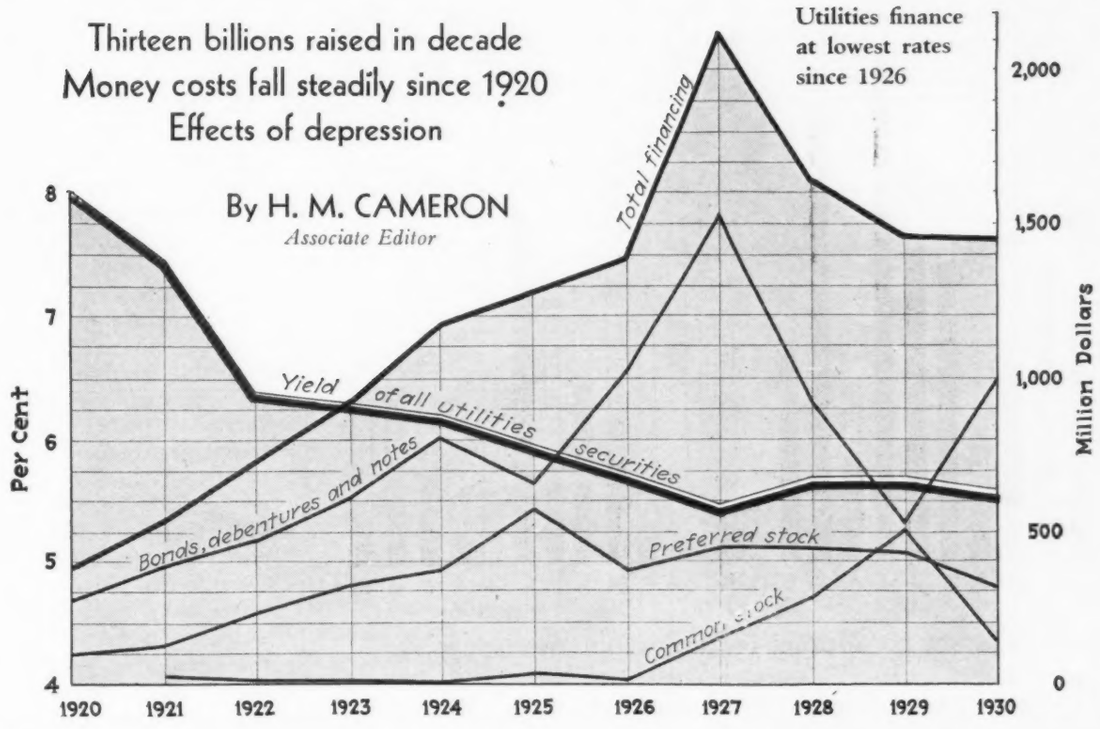
Oversea Ties of the American Telephone & Telegraph and Associated Companies



Back to Senior Financing

Thirteen billions raised in decade
Money costs fall steadily since 1920
Effects of depression

By H. M. CAMERON
Associate Editor



TEN years ago the power and light industry faced the prodigious task of raising $13,000,000,000 within a decade. That was the total that new construction and refunding was going to need. The industry at the time was capitalized at only $4,000,000,000. Total financing in 1920 was but $369,000,000, and this was secured with effort and resistance and with money rates at the top. Had utility executives known the immensity of the decade's capital needs the great majority would have said the task was an impossible one. A brief résumé of the financing operations of the period does much toward clarifying the present situation.

The high cost of capital around 1920 was due partly to competition in the money market, resulting from rapid industrial development, and partly to the unsatisfactory credit status of the industry. Some utility executives had been so shortsighted as to float loans on prospective profits rather than on actual earnings. The industry as a whole reaped the results. Then there was sporadic agitation for lower rates and for municipal control. As a net result the power and light industry had to pay close to 8 per cent for its capital needs at that time. The average yield on seasoned utility bonds was from 1 to 2 per cent higher than on railroad issues and was sometimes higher than that on representative industrials.

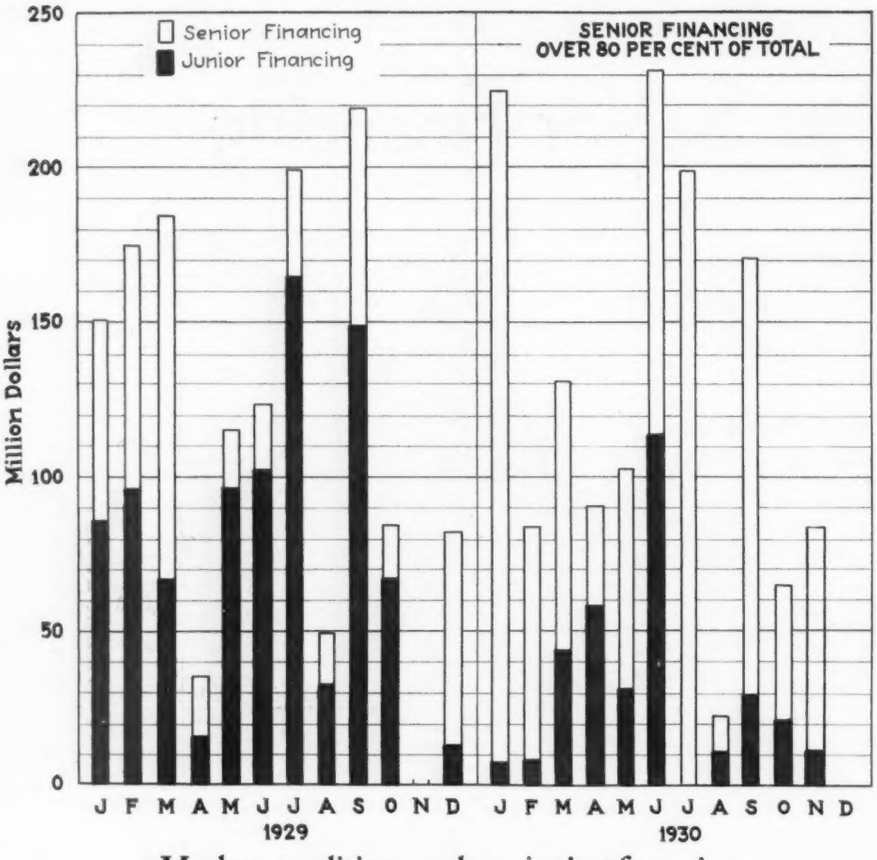
But owing to general trade conditions, money rates in the world markets soon turned downward. Furthermore, in the industry itself there were economies of consolidation and net earnings commenced to show a more substantial annual growth. Public confidence gradually was re-established and the institutional market for utilities securities expanded. Capital costs declined steadily to a low point in 1927, when they amounted to 5.46 per cent. Since then they have remained fairly level. Last year the average was 5.59 per cent. Mortgage bond financing was on a basis slightly under 5 per cent. Debentures averaged 5.46, notes 5.24 and preferred stock, publicly sold, 5.94 per cent.

With money rates at high levels toward the beginning of the decade, short-term issues were more popular. Maturities increased inversely with money rates and mortgage bond financing reached its height in 1927. Meanwhile, stock financing began to expand. Financing

Financing Four Times 1920 Total

	Sales by Investment Houses	Sales Direct to Customers	Total Securities Sales
1920	$326,374,000	$43,000,000	$369,374,000
1921	458,917,000	80,000,000	538,917,000
1922	589,961,000	130,000,000	719,961,000
1923	747,722,000	175,000,000	922,722,000
1924	982,421,000	254,000,000	1,236,421,000
1925	982,223,000	297,561,000	1,279,784,000
1926	1,150,965,000	236,557,100	1,387,522,100
1927	1,888,909,000*	263,527,000	2,152,436,000
1928	1,471,497,000*	181,682,041	1,653,179,041
1929	1,328,708,762*	153,436,000	1,482,144,762
1930	1,452,853,841*	135,000,000†	1,587,853,841

*Including rights. †Estimated.



Market conditions reduce junior financing

difficulties already referred to proved a blessing in disguise, as they helped to enforce local financing and taught the real merit of customer sales of preferred stock. Also, the public clamoring for equity securities arising out of bull market conditions, especially from 1927 on, made it feasible to issue large quantities of rights and option warrants and to add this element or convertibility to bonds and preferred stock.

Capital structures were accordingly built on a sound and better balanced basis than formerly. Equity and borrowings are now about evenly divided. Heavy refunding operations have retired most of the old high-priced issues.

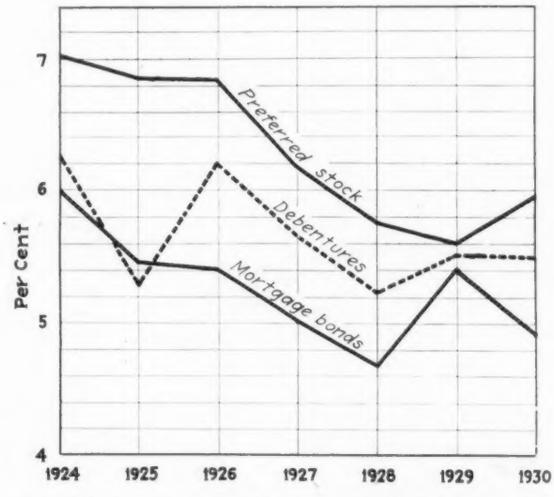
This brings us up to the current situation. Market conditions during the past year have been such as to cause something of a reversal to senior financing. In 1929 equity financing took the lead. Last year selling stock was a much more difficult task and there was a sharp rise in bond sales, although totals for all classes were about the same. Only one-third of all public financing in 1930 was in the form of junior issues. Preferred stock sold publicly and to customers amounted to $314,158,000 and common stock, including the issue of rights, added another $160,000,000. The total was thus about half of the 1929 stock total of $940,000,000.

Bond, debenture and note financing made up the balance. Total for these classes was just slightly over $1,114,000,000, against $523,000,000 the year before.

In 1930, $373,761,600, or about one-third of the total public financing, was for refunding purposes. Economies thus effected amounted to from 1 to 2 per cent, which, on the total shown, represented a worth-while annual saving. Portland General Electric Company, for example, sold an issue of $40,000,000 first and refunding mortgage gold bonds, 4½ per cent series, at 93¾ and interest to yield 4.90 per cent. The proceeds were used to retire approximately $29,000,000 of 5 to 7½ per cent mortgage debt outstanding against the properties.

There can be no doubt but that certain adjustments had to be made in financing programs as a result of the depression. A number of major consolidations are stated to have been temporarily postponed and there seems little prospect of their consummation in the near future. Such mergers usually involve an exchange of stock between the companies concerned. A stable or rising market is virtually essential for such operations in order that the public may be induced to participate. It would be difficult to work out the terms of an exchange in so unstable a market as that which has existed in recent months. In the case of the larger systems, whose credit is unquestioned, the depression has had little if any definite effect upon the financing program. Typical of such companies are the Insull properties. Samuel Insull stated recently, "We have had no trouble in selling for investment either stock or bonds." Since this statement was made two Insull companies have offered about $30,000,000 in rights to buy common stock, presumably to implement an earlier undertaking.

The situation is similar in the case of Public Service



Yield declines on bonds and debentures

Electric Light and Power Securities Sold in 1930

	Amount of Issue	
Mortgage Bonds (average yield 4.97 per cent)		
12 issues yielding from 4.00 to 4.72 per cent..	$116,979,000	
11 issues yielding from 4.75 to 4.96 per cent..	113,250,000	
9 issues yielding from 5.00 to 5.09 per cent..	46,890,000	
7 issues yielding from 5.10 to 5.19 per cent..	66,679,500	
6 issues yielding from 5.20 to 5.29 per cent..	39,714,000	
9 issues yielding from 5.30 to 5.52 per cent..	3-,273,500	
11 issues yielding from 5.60 to 5.94 per cent..	27,865,000	
7 issues yielding from 6.11 to 6.50 per cent..	10,669,600	
72 issues		$477,320,600
Debentures (average yield 5.64 per cent)		
5 issues yielding from 5.00 to 5.40 per cent..	103,115,600	
4 issues yielding from 5.50 to 5.55 per cent..	89,000,000	
4 issues yielding from 5.75 to 5.88 per cent..	85,000,000	
3 issues yielding from 6.04 to 6.17 per cent..	78,500,000	
5 issues yielding from 6.25 to 6.50 per cent..	22,000,000	
21 issues		377,615,600
Notes (average yield 5.24 per cent)		
3 issues yielding from 3.87 to 4.25 per cent..	40,000,000	
9 issues yielding from 5.01 to 5.78 per cent..	194,500,000	
7 issues yielding from 6.00 to 6.95 per cent..	25,200,000	
19 issues		259,700,000
Preferred Stock (average yield 5.94 per cent)		
7 issues yielding from 5.12 to 5.95 per cent..	79,206,334	
9 issues yielding from 6.00 to 6.09 per cent..	72,787,500	
3 issues yielding from 6.55 to 7.21 per cent..	15,040,000	
1 issue	12,125,000	
20 issues		179,158,834
Common Stock		
1 issue		2,240,000
Rights		156,818,807
Total public sales		1,452,853,841
Estimated local sales to customers		135,000,000
All financing		$1,587,853,841

Corporation of New Jersey. Asked for a statement on his company's experience, P. S. Young, vice-president, said: "The financing programs of this company have not been affected by the depression. Money has been available at low rates, and consequently there has been a good demand for seasoned securities." Mr. Young added that no adjustments in original financing plans were made necessary.

This seems to be the majority experience in the industry. Some of the less favorably situated systems have had to make rapid calculation changes in their financing plans, but there is little evidence of any serious hardship in this respect.

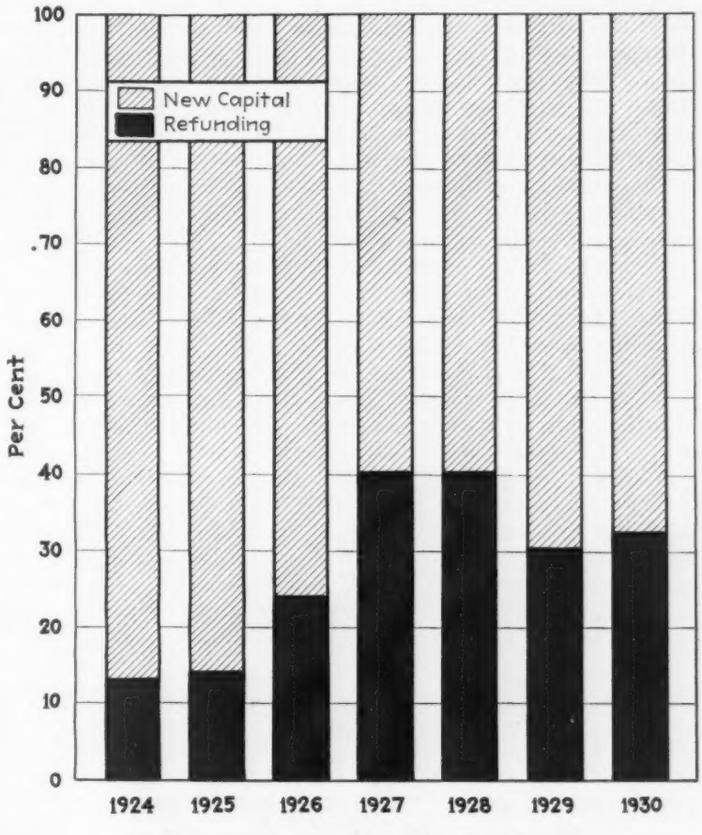
Outlook for the next decade

But the financial problems of the decade now opening are more staggering even than those faced in 1920. On a conservative estimate the capital investment of the light and power industry will be about $19,000,000,000 by 1940, as compared with the present figure of $11,800,000,000. In the next decade more than $11,000,000,000 will be spent for additions to plant and physical property. This total, together with refunding needs likely to arise, make the financing program of the industry in the order of at least $15,000,000,000 during the decade, an average of $1,500,000,000 each year.

Over against this huge program is the favorable credit position of the industry. Capital structures are sound, well balanced and flexible. These advantages must be used to the utmost to meet future financial demands. Capital structures are considered well proportioned when erected on a basis of 50 to 60 per cent senior securities, 20 per cent preferred stock and 20 to 30 per cent common stock. The open-end mortgage is almost universal and securities are issued in the name of the holding companies in the case of the majority of new issues.

The method and the means of raising the enormous amount of capital needed in the next decade are adequate. Whether they can be used will be determined by the credit position or earning power of the industry. No one can predict money market conditions far in advance with any degree of accuracy. Undoubtedly utility securities will settle down to a rather stable market price and earning value in the next decade and the credit position maintained will determine the volume of investment funds that this industry can attract in competition with all others.

Public appreciation of the merits of utility securities has been amply demonstrated during the past five years. With the gradual improvement in business and the stock market there is little probability that the utilities will meet great resistance in securing their capital needs.



Slightly larger volume of refunding this year

Increased Power Will Increase Radio Sales

Higher powers for existing broadcasting stations will open new levels for radio purchases. Customer saturation absent

By O. H. CALDWELL
Editor "Electronics"

RADIO receiver sales in any territory depend upon the technical and program character of the broadcast service received, as can be shown by repeated examples when tracing the history of broadcasting to date.

In 1926, when the radio law broke down and radio broadcasting relapsed into a state of chaos, the effect was immediately shown in the collapse of retail radio sales. Again, as early powers of broadcasting stations were increased, radio sales mounted upward. Better broadcasting is thus an effective stimulant to radio set sales.

Within the last two weeks radio leaders who have been interviewed all seem to expect a contraction in radio sales volume during 1931 and 1932. They say that "saturation" is now so far advanced that we cannot again have a 4,000,000-set year; that the next two years will average only between 3,500,000 and 3,000,000 sets each. But let us look at the real facts of the situation from the broader angles of the radio art.

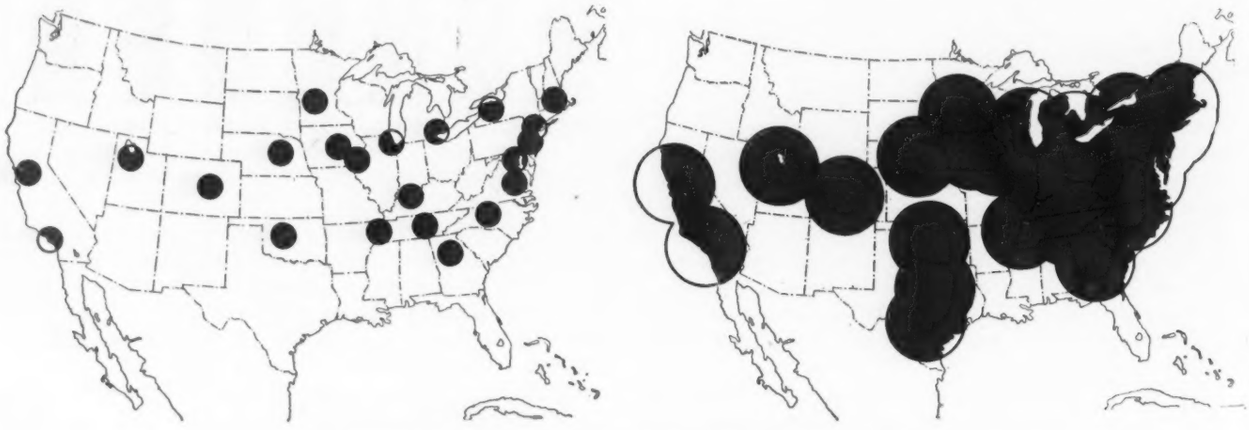
In those parts of the United States where good broadcasting service—that is, high signal strength—is now being had it is true that saturation is approaching a fair degree of intensity, for all of the radio sets sold during recent years have been going into these regions.

But 40 per cent of the nation's population live 75 miles or more from any broadcasting station. In these poorly served territories, where only one or two programs are received, each spoiled by static, few radio sets, naturally, are yet in use. The solution of the radio industry's problem, then, is to get existing broadcasting stations to increase their powers to reach these now sterile sections.

At this moment 28 leading independent broadcasters from all parts of the country are in Washington applying for an increase in their power to 50 kw., being willing to spend $300,000 each to improve their service ranges—the very thing that all the listeners, the farmers and the radio manufacturers and dealers most want them to do. But the Radio Commission, operating against the consensus of all engineering opinion, holds back against this necessary and inevitable action on account of political pressure.

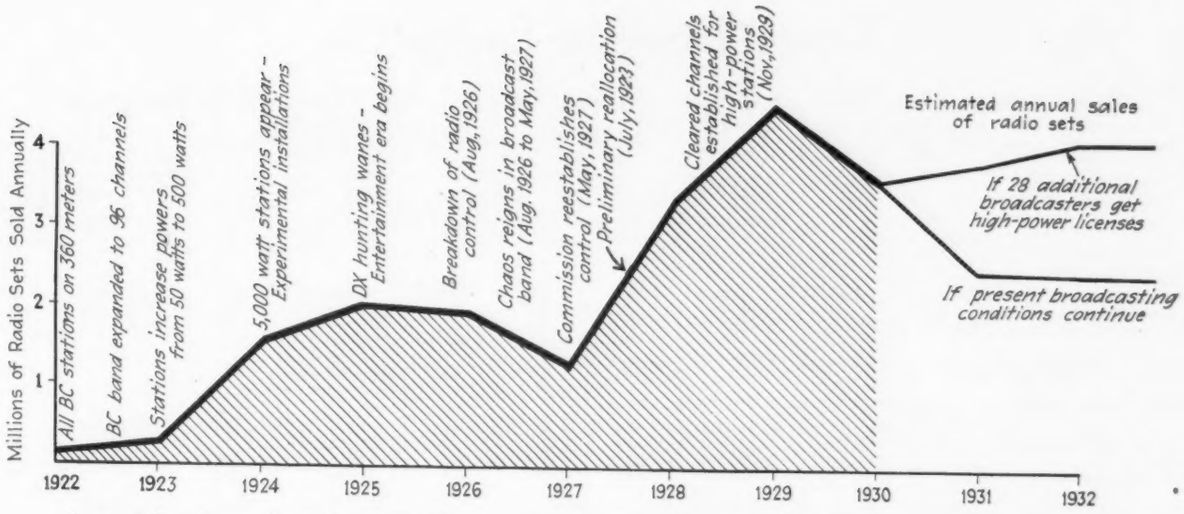
Already many radio manufacturers and other industry leaders have gone on record as favoring high power. This was a sound action for them to take, but for their own self-preservation the present emergency demands that they go emphatically further, entering the battle vigorously in the interest of the whole radio manufacturing industry.

With radio manufacturing volume otherwise taking a drop of 1,000,000 to 500,000 sets during 1931 and 1932, prompt action in getting high-power broadcasting is the one remaining fundamental factor which can restore



Present and possible fair-quality service areas

At left are fair-quality areas of 28 broadcasting stations asking 50-kw. licenses. At right are fair-quality areas of all 50-kw. stations if present applications are granted.



Annual sales of radio-receiving sets show influence of broadcasting conditions

radio sales to their past happy situation of 3,000,000 and 4,000,000 set years. Thus upon the prompt action of the Radio Corporation in granting high-power licenses there now await $10,000,000 in broadcast station sales; $100,000,000 in receiving set sales, the prosperity of the radio industry and employment of 100,000 radio workers.

▼ ▼ ▼

Confidence—the Essential—Is Renewing

By MARTIN J. INSULL

President Middle West Utilities Company, Chicago, Ill.

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A NOTICEABLE feature of the early months of 1930 was the fact that the state of mind of American business was apparently more depressed than business itself, which tended toward a continuing decrease. Today the state of mind has not only improved but is possibly even better than business is at the moment. This, however, of itself is a strong indication that business is improving, as confidence and courage are prime requisites.

We must recognize the simple but frequently obscured fact that not money but goods is the output of business. No matter what the mechanics of distribution, such as currency and credit, we have only one thing to distribute, and that is the output of our factories and farms. In other words, our people must, in the end, receive their compensation in the form of goods, which is to say that their earnings must be devoted, within provident limits, to the consumption of goods if our economic machine is to function effectively. To consume goods we must have the courage to use our money to buy them. "Payment in kind" is, after all, the fundamental basis of our business and determines whether times are good or bad.

The electric light and power industry in 1930 presented a picture of rather happy adjustment to the primary necessities of our economic system. In a period when overproduction had become a problem, sales of power to large industrial producers of the United States as a whole declined, though not materially, compared with 1929. For the territory as a whole served by the Middle West Utilities System, sales of power for the year to large producers increased, but the rate of increase showed a considerable decline.

On the other hand, sales of electric energy to domestic consumers, both in the United States as a whole and in the territory served by the Middle West Utilities System, registered a satisfactory increase over even those of 1929.

It seems to me that the trend of energy sales, and especially those of the past few weeks, is most assuring evidence that confidence and courage are growing in our industrial and trade system and must finally result in continuously improving business conditions.

Typical Domestic Energy Use

Average energy per home for 41 large utility systems increased 22 per cent in four years

Company	1925		1926	1927	1928		1929	
	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year
NEW ENGLAND								
The Connecticut Light & Power Co.	16,236,089	316	335	382	35,524,397	437	46,288,263	482
Hartford Electric Light Co.	15,931,000	368	350	392	25,206,000	441	29,001,353	498
The Worcester Electric Light Co.	13,165,643	302	316	326	17,056,074	373	18,935,713	405
Total	45,332,732				77,786,471		94,225,329	
Weighted average		**330**	**335**	**371**		**422**		**468**
MIDDLE ATLANTIC								
The Philadelphia Electric Co.	107,057,718	333	370	391	171,575,361	410	239,871,581	476
Buffalo General Electric Co.	83,822,470	694	734	743	108,798,783	784	115,794,425	802
Pennsylvania Power & Light Co.	34,770,110	279	331	331	81,496,970	358	92,660,130	394
Penn. Central Power & Light Co.	12,968,105	379	412	449	18,686,997	454	23,094,390	477
Total	238,618,403				380,558,111		471,420,526	
Weighted average		**394**	**440**	**471**		**485**		**492**
EAST NORTH CENTRAL								
Pennsylvania-Ohio Power & Light Co.	26,639,435	472	476	498	40,941,313	500	30,075,526	564
Commonwealth Edison Co.	323,219,000	476	494	521	438,323,000	562	483,645,000	592
Ohio Public Service Co.	25,223,854	457	414	458	33,362,488	504	38,416,769	556
Detroit Edison Co.	174,359,654	478	517	532	259,562,571	561	305,349,876	631
Toledo Edison Co.	30,672,610	437	392	414	38,062,338	464	44,966,150	518
Cleveland Electric Illuminating Co.	106,070,467	498	500	544	146,932,924	575	168,045,953	616
Central Illinois Light Co.	8,935,037	310	344	374	14,487,141	443	17,140,613	500
Wisconsin Public Service Corp.	7,277,520	283	280	302	11,076,899	347	13,347,368	393
Total	702,397,577				982,748,674		1,100,987,255	
Weighted average		**470**	**487**	**512**		**548**		**595**
WEST NORTH CENTRAL								
Northern States Power Co.	80,734,981	281	354	382	113,882,808	414	130,412,332	461
Minnesota Power & Light Co.	15,966,663	433	394	409	16,385,210	438	17,140,028	468
Kansas Gas & Electric Co.	15,256,802	370	387	425	21,425,344	454	25,295,013	509
Kansas City Power & Light Co.	41,055,468	446	467	507	56,388,633	553	61,161,457	586
Empire District Electric Co.	5,967,268	393	276	286	6,240,919	357	6,983,666	359
Nebraska Power Co.	19,604,728	420	444	455	29,085,262	544	30,496,727	542
Total	178,585,910				243,408,176		271,489,223	
Weighted average		**377**	**388**	**415**		**460**		**494**
SOUTH ATLANTIC								
Consolidated Gas, Electric Light & Power Co.	55,027,695	402	441	486	92,911,390	525	107,270,622	565
Carolina Power & Light Co.	5,818,447	319	363	412	22,102,115	435	25,386,827	494
Total	60,846,142				115,013,505		132,657,459	
Weighted average		**393**	**423**	**472**		**506**		**550**
EAST SOUTH CENTRAL								
Southeastern Power & Light Co.	21,321,481	324	352	411	89,885,929	435	123,495,600	538
Birmingham Electric Co.	11,828,759	304	320	347	19,456,044	376	21,865,397	414
Memphis Power & Light Co.	10,490,936	333	617	396	16,086,234	444	18,882,770	493
Total	43,641,176				125,428,207		164,243,767	
Weighted average		**317**	**342**	**397**		**427**		**513**
WEST SOUTH CENTRAL								
New Orleans Public Service Inc.	16,235,561	301	356	398	29,561,092	430	29,918,466	414
Texas Power & Light Co.	15,920,936	315	324	355	29,545,446	387	33,439,424	415
Houston Lighting & Power Co.	15,290,963	345	361	377	25,617,181	404	28,976,059	417
Oklahoma Gas & Electric Co.	18,824,840	342	308	337	31,807,479	356	39,150,310	399
Dallas Power & Light Co.	16,561,509	365	383	397	23,119,297	430	26,252,082	464
Fort Worth Power & Light Co.	10,323,569	390	358	312	11,176,377	352		
Total	93,157,378				150,826,872		157,736,341	
Weighted average		**340**	**344**	**366**		**391**		**418***
MOUNTAIN								
Montana Power Co.	16,548,715	463	516	493			30,162,023	605
Utah Power & Light Co.	30,045,109	388	405	436	37,575,972	442	45,676,048	527
Public Service Co. of Colorado	27,544,797	328	316	326	33,704,602	345	38,566,484	385
Idaho Power Co.	45,655,688	1,400	1,290	1,150	30,754,762	895	36,187,086	1,006
Total	119,794,309				102,035,336		150,591,641	
Weighted average		**517**	**512**	**500**		**470**		**531**
PACIFIC								
Portland Electric Power Co.	39,490,832	546	597	545	68,013,731	771	59,429,300	662
California-Oregon Power Co.	15,157,635	1,178	1,210	1,420	26,005,686	1,542	30,788,858	1,640
Northwestern Electric Co.	10,732,935	670	817	936	22,288,054	1,020	25,161,490	1,057
Los Angeles Gas & Electric Co.	38,265,656	382	388	440				
Pacific Power & Light Co.	14,599,261	454	533	743	37,903,437	778	43,645,568	890
Total	118,246,319				154,210,908		159,025,216	
Weighted average		**508**	**592**	**603**		**714***		**728***
UNITED STATES TOTAL	**1,667,567,484**	**447**	**452**	**473**		**507**	**2,702,376,747**	**547**

*Adjusted for companies not reporting residential consumption in these years.

Domestic Use Increases

DOMESTIC business has proved very stable during the business depression and many utilities have been aggressive in selling homes more electric service. Data from 41 large utilities show that energy sales to domestic customers have increased 22 per cent in four years. The national average for these utilities has increased from 447 kw.-hr. per customer in 1925 to 547 kw.-hr. per customer in 1929. These utilities sold an aggregate of 2,702,376,747 kw.-hr. to residential customers in 1929.

Full-use electric service in homes corresponds to about 7,000 kw.-hr. per year and the 547 figure shows how far from saturation is this class of business. The refrigerator has aided greatly in increasing the business and the water heater and range are being sold aggressively. During the year many inducement rates were adopted by utilities and about fifteen utilities now have off-peak water heating rates that have proved to be effective in encouraging this business.

A study of the domestic business in the several geographical sections shows that the Pacific States lead with 890 kw.-hr. per customer; the next highest is the East North Central region, with 595 kw.-hr., and the lagging region is the South Central, with only 418. It is striking to find the large cities in the industrial regions of the country ranking very high in per customer use despite the dilution effect of many small apartments.

Kilowatt-Hours per Domestic Customer Rapidly Building Up Everywhere

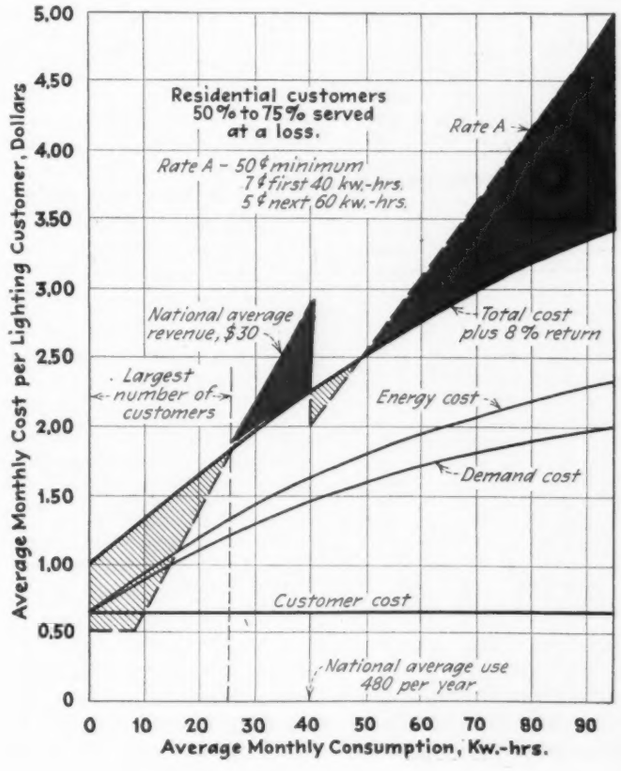
Regional averages for 41 major systems are typical of entire industry

Section	1925	1926	1927	1928	1929
New England	330	335	371	422	468
Middle Atlantic	394	440	471	485	492
East North Central	470	487	512	548	595
West North Central	377	388	415	460	494
South Atlantic	393	423	472	506	550
East South Central	317	342	397	427	513
West South Central	340	344	366	391	418
Mountain	517	512	500	470	551
Pacific	508	592	603	714	728
Total United States.	447	452	473	507	547

On the Pacific Coast the high use is accounted for by the use of ranges, water heaters and water pumps in larger measure than elsewhere.

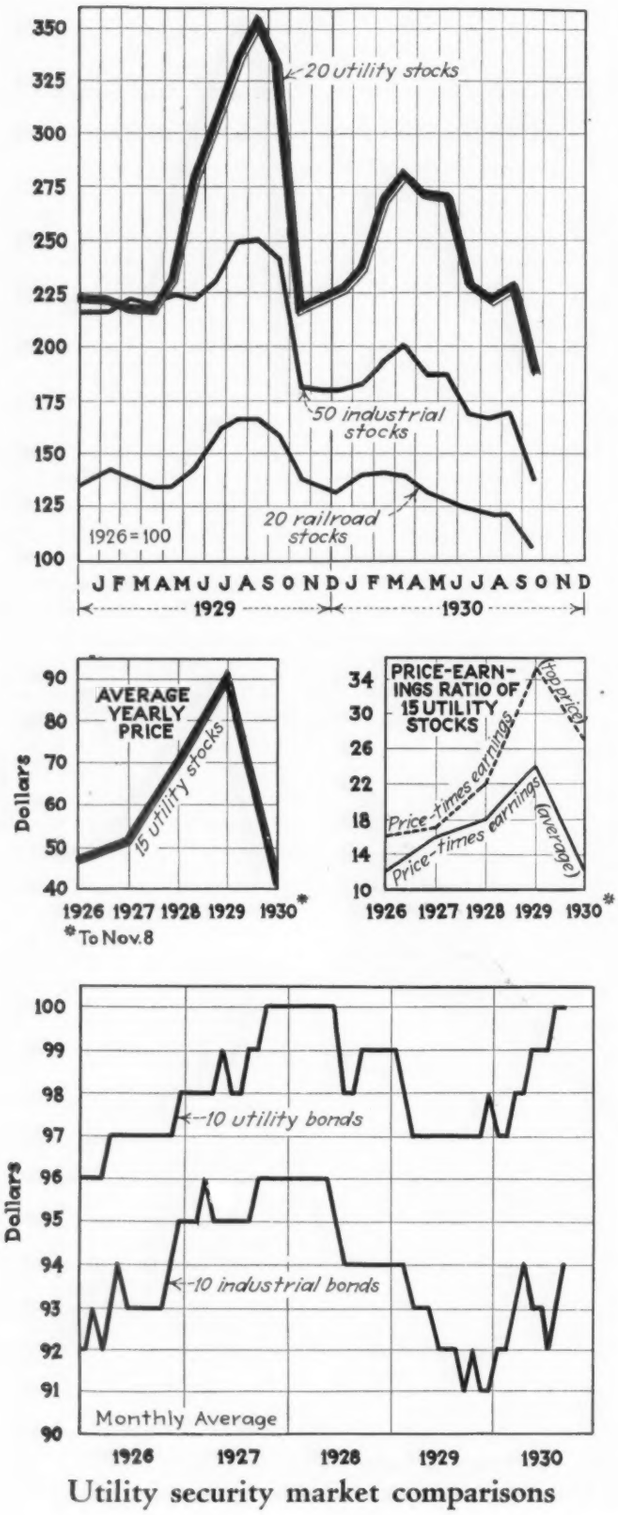
Undoubtedly the electric refrigerator has been chiefly instrumental in increasing domestic use generally in the past four years and the coming campaign should augment this effect. But there remains a very large business to be had, and the range and water heater are but stepping-stones to house heating and air conditioning, with a possible economic domestic use of 40,000 kw.-hr. per home for a large percentage of the customers.

A graphic picture of the inadequacy of the kilowatt-hour as the single basis of charge



For domestic rates to be equitable for large users as well as small users there should be a charge based on investments in service facilities as well as a charge based on energy use. The cost of energy is a relatively small part of the total cost of service for the majority of domestic customers. Either their consumption must be increased, large-use customers pay part of their cost or some form of capital charge must be added to the energy charge.

Stocks Again Valued on Earnings Basis



Utility security market comparisons

Six billion dollars has been clipped from utility stock values. Now twelve, rather than thirty-five, times earnings

DELAYED mergers, speedily adjusted financing programs, a shifting of stock ownership from the small to the larger holders—these are some of the byproducts of 1930's disappointing and unstable market.

The unduly high swing of the market pendulum in the bull market of 1927-29 was quite naturally followed by a reverse action—probably also too far. Competitive buying of utility stocks and properties in the merger movement, as well as a gradual betterment in the credit standing of power and light companies, had led to an optimism which lost sight of earning capacity of the properties concerned. The culmination of this movement coincided, partly as cause and partly as effect, with the peak of utility financing operations.

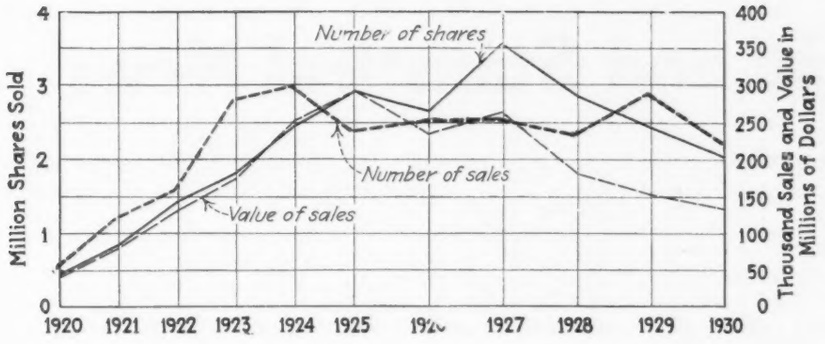
Although 1930 opened with prospects of recovery and a strong upward movement lasting through the first quarter, the trend turned sharply in April. From then on averages sagged steadily to the year-end, interrupted only by spasmodic buying movements. At the end of 1930, prices were far below levels at the end of 1929.

The down-swing of the pendulum has brought prices back to bedrock, has forced out most of the speculative element, as well as much of the small investment element, and has left stocks generally in the hands of larger holders. Average utility stock prices, which were 35 times earnings at the peak of the bull market, sank to around twelve times earnings at the end of 1930.

The merger movement, however, is largely completed. Utility stocks have returned to a level more nearly justified on an earnings basis, and it is probable that actual earning capacity rather than prospects will be the criterion used by investors for some time. The industry is, if anything, in a sounder position than when prices were two or three times present quotations.

As a net result of the year's market operations, aggregate values of utility stocks have been cut by billions. Twenty-nine representative utilities show a cut of about six billion dollars since November 30, 1929. In comparison with November, 1928, present levels show a substantial loss. The decline in this group from August 31 to November 30, 1930, was over two billions.

The bond market continued its generally upward trend during the first few months of the year. Bond prices continued firm throughout the early part of 1930, but shared the downward movement of stocks toward the end of the year. The average yield on power and light bonds is now around 4.75 per cent against a yield of around 5 per cent five years ago and 6.75 ten years ago.



$135,000,000 in Shares to Customers

Only 12 per cent decrease in security sales to customers in 1930. Sales in ten years $1,900,000,000. Ten per cent of utility customers now own securities

SALES of stock by electric light and power companies reached their peak in 1925. Starting from small beginnings about a decade earlier, the number of shares sold in that year mounted almost to 3,000,000, with a value just short of $300,000,000. Since that time the trend has been generally downward in number of shares and in aggregate value, though the introduction of sales at other than the $100 level has held the number up more than it has the value.

In view of the more favorable conditions during 1930 for financing by means of bond issues a severe decrease in local stock sales would not have been surprising. Compared with the preceding year the drop was not excessive. In value the sales fell from $153,436,000 in 1929 to $135,000,000 in 1930, the latter figure being subject to correction when complete returns for the year have been received. The decrease is about 12 per cent. The number of transactions decreased from 280,000 to 217,000; the value per transaction, on the contrary, rose from $545 to $620.

Because of the varying prices at which shares have been sold, ranging all the way from $25 to $100, the number of shares is less significant; it decreased from 2,432,550 to 2,030,000. A change in average value from $63 to $65 is indicated.

Customer ownership sales fluctuate widely from month to month. Most companies follow the practice of putting on periodic campaigns, consequently a report of heavy sales by one company, which may go as high as $7,000,000 or $8,000,000 will greatly increase the total for a given month. Those totals during 1930 varied from a minimum of $6,240,000 in August to a maximum of $21,400,000 in April.

During the year three large companies reported sales approximating, respectively, $13,000,000, $7,000,000 and $6,000,000, the two first with continuous sales rising occasionally to a high peak, the other in two short and active campaigns. These were on single properties. If entire holding-company groups were included even larger totals would appear.

While some companies are having smaller sales than in the past, others hold steadfastly to the practice of making their customers partners in the enterprise. Even if the two and a quarter million separate transactions in the ten-year period from 1921 to 1930 involve some duplication in the form of successive sales to the same customer, it is probable that about 10 per cent of the consumers of electric light and power have a financial interest in their local utility; while undoubtedly some of the stock was subsequently disposed of, the fact remains that during the same period customers and employees invested locally more than $1,900,000,000—a fifth of the total investment in the entire industry.

Results of Customer Sales

Year	Number of Sales	Value	Number of Shares
1920	53,063	$43,000,000	454,139
1921	18,544	80,000,000	830,222
1922	156,725	130,000,000	1,450,707
1923	279,186	175,000,000	1,806,300
1924	294,467	254,000,000	2,478,165
1925	236,043	297,561,800	2,926,271
1926	248,867	236,557,100	2,686,187
1927	249,491	263,527,269	3,581,206
1928	227,961	181,682,041	2,880,833
1929	280,600	153,436,000	2,432,550
1930*	217,000	135,000,000	2,030,000

*Partly estimated.

Financial and Statistical News

UNFAVORABLE year-end factors affecting the general market situation include failure of business to show definite recovery, resumption of commodity price decline, curtailment of steel operations, the closing of additional banks and utter indifference to market opportunities on the part of investors.

——ON THE OTHER SIDE of the balance the effect of further money ease, instanced by the reduction of the New York Federal Reserve Bank rate from 2½ to 2 per cent, is expected to be felt in the bond market, which already shows an inclination toward recovery.

——COMMON STOCK PRICES of twenty utilities again reached a new low level this week, showing an average yield of about 4.5 and a price-to-earnings ratio of less than 12.

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Expansion Continues on Pacific Coast

CONTINUANCE OF THE EXPANSION program of the Puget Sound Power & Light Company, Seattle, Wash., throughout 1931 becomes a certainty with approval just given by the directors to the construction budget, W. H. McGrath, vice-president, has announced.

There will be expended by the company in its territory nearly $21,000,000, inclusive of construction costs, operation and maintenance, taxes, and local dividends and interest during the year just beginning, he states.

Construction plans to be carried out include expenditures totaling $10,310,000. Most of this amount is for power plant, transmission and distribution system costs. In 1930 these items aggregated $12,201,000; for 1931 the total is $9,308,000. The greater expenditure in 1930 included $1,691,000 for completion of the second 50,000-hp. unit at the Shuffleton steam plant. No further expansion of this plant is planned for 1931.

There is allotted for carrying on work at Rock Island $6,755,000 and for the transmission line over the Cascades from Rock Island $847,000, bringing the total to be expended on that hydroelectric project to $7,602,000.

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October Revenue Holds Up; Output Down

OCTOBER brought to the electric light and power industry in the United States an aggregate revenue of $182,990,000, according to reports received by the ELECTRICAL WORLD from operating companies throughout the country. The increase compared with September is $8,050,000 and is equivalent to 4.6 per cent. Again the revenue exceeded that of the corresponding

South Atlantic States gained most in revenue and decreased most in generation

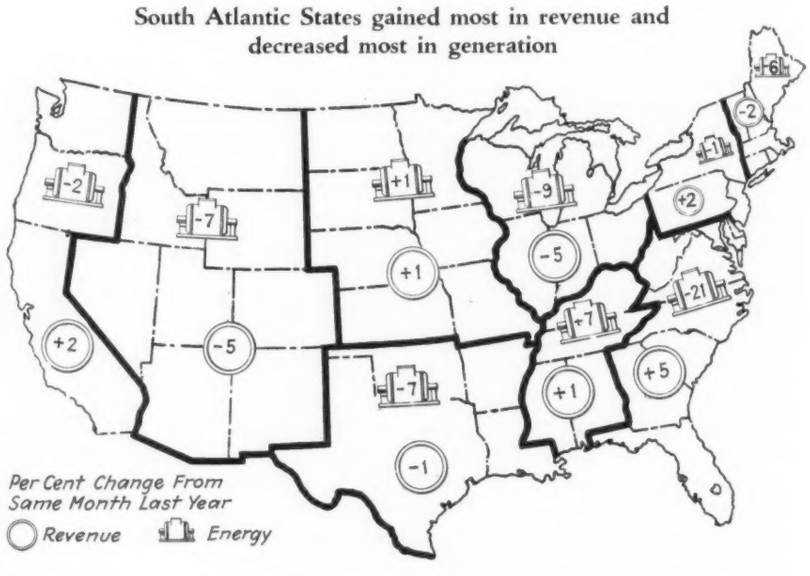


Table I—Central-Station Financial Operations in the United States[1]

Compared with Corresponding Month of Previous Year

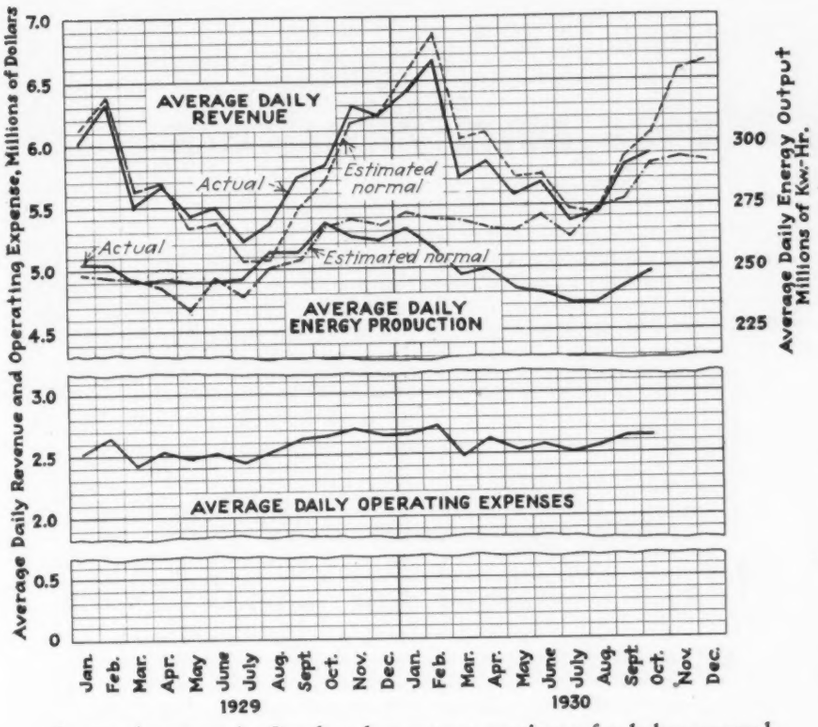
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1930 Thousands	1929 Thousands	Per Cent Inc.	1930 Thousands	1929 Thousands	Per Cent Inc.
July	$167,200	$162,300	+3.0	$77,500	$76,000	+2.0
August	168,100	166,200	+1.1	78,300	78,050	+0.3
September	174,940	173,600	+0.8	78,800	78,490	+0.4
October	182,990	182,500	+0.3	81,640	82,540	—1.1

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1930	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
July	3,201,394	—3.6	692,444	+3.3	10,459,372	+18.2
August	3,410,314	—6.5	731,854	—3.8	11,028,887	+ 6.9
September	3,478,826	—4.1	812,523	+3.1	10,544,038	— 5.5
October	3,676,921	—2.5	857,513	—18.3	10,401,524	—16.1

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.
(1) The financial statistics for 1929 have been revised as explained on page 665 of the issue of March 29, 1930.



Seasonal up-turn in October, but output continues far below normal

month of 1929, though by the close margin of 0.3 per cent. Operating expenses, up 3.4 per cent from September, made the unusual move of falling fully one per cent below last year's figure for the same month. The total was $81,640,000. There results an increase of 1.3 per cent in net.

Maintenance of a favorable increase in retail sales is seen in the fact that revenue increased notwithstanding a decrease relatively to October, 1929, of 6.3 per cent in energy generated; this amounted to 7,675,418,000 kw.-hr., which is 390,600,000 more than the September output. The continuing deficiency of water power resulted in a decrease, compared with the production a year ago, of nearly 18 per cent—2,067,649,000 kw.-hr. this year against 2,518,495,000 kw.-hr. last year. This left a decrease of 1.2 per cent in the energy generated from fuel, which was accompanied by a decrease of 2.5 per cent in the amount of coal consumed and much greater reductions in oil and gas fuel.

Regionally every section except the Far West and the Southwest earned more revenue than in September, but compared with October, 1929, the gains were spotty. In the South Atlantic States they reached 4.6 per cent, in the Middle Atlantic 2.2 per cent, on the Coast 1.7 per cent. The industrial Middle West continues to be the country's low area, with a decrease of 5.1 per cent, followed by the Mountain States, losing 4.5 per cent, and New England, 1.7 per cent. The reduction in operating expenses was general and not confined to any one section.

Energy output was almost everywhere smaller than it was a year ago, the only important exception being the rise of 6.7 per cent in the East South Central States. The most notable decrease came in the South Atlantic States, where it exceeded 20 per cent, and where production from water-power was more than cut in half. Large transfers of energy to meet scarcity of power in various regions resulted in unusually large sales of energy for resale, which exceeded both the September figure and that of the preceding October by more than 10 per cent.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1930	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
July	7,328,621	—2.5	2,589,885	— 9.0	4,738,736	+1.4	1,915,000	+18.9
August	7,352,191	—6.3	2,234,477	—14.5	5,117,714	—2.2	1,995,000	+13.5
September	7,284,818	—3.7	2,036,015	— 9.7	5,248,803	—1.1	1,980,000	+10.6
October	7,675,418	—6.3	2,067,649	—17.9	5,607,769	—1.2	2,190,000	+11.8

Table IV—Regional Operations, Revenue and Energy Output in October, 1930

Compared with Corresponding Month of Previous Year

Region	Revenue[1]		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	182,990	+0.3	7,675,418	— 6.3	2,067,649	—17.9	5,607,769	— 1.2
New England	18,570	—1.7	521,161	— 7.8	109,467	— 7.9	411,694	— 7.8
Middle Atlantic	47,020	+2.2	1,944,172	— 1.3	345,222	—26.6	1,598,950	+ 6.6
East North Central	44,090	—5.1	1,845,993	— 8.6	124,477	—16.9	1,721,516	— 8.0
West North Central	15,250	+1.1	496,901	+ 1.0	97,782	— 8.3	399,119	+ 3.5
South Atlantic	19,730	+4.6	852,292	—20.8	230,709	—62.5	621,583	+34.8
East South Central	6,350	+1.0	295,643	+ 6.7	199,070	0.0	96,573	+21.9
West South Central	10,850	—0.5	422,386	— 6.6	4,492	+88.8	417,894	— 7.1
Mountain	4,130	—4.5	290,221	— 7.4	224,428	—14.1	65,793	+15.3
Pacific	17,000	+1.7	1,006,649	— 1.8	732,002	+22.0	274,647	—35.4

*As collected by U. S. Geological Survey.
(1) The revision of the statistics on revenue is discussed in the issue of March 29, 1930, on page 665.

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Telephone Budget

THE EXPENDITURE of $11,167,590 for construction throughout the state in 1931, bringing total authorizations for the year to $97,660,195, was announced by the New York Telephone Company. Of the total, approximately $80,000,000 will be spent in the New York metropolitan area.

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San Diego Utility Offers Notes

FOUR PER CENT gold notes of the San Diego Consolidated Gas & Electric Company have been offered to the amount of $1,500,000, the price being 99½ and interest, yielding more than 4.55 per cent. Proceeds from the sale of these notes will be used to retire current indebtedness and to reimburse the company, in part, for extensions and additions heretofore and now being made to the properties of the system.

Business News and Markets

N. E. M. A. Midwinter Meeting, January 19-23

A PRELIMINARY PROGRAM has been announced for the 1931 midwinter meeting of the National Electrical Manufacturers' Association to be held in New York, January 19-23. More than thirty meetings are planned for sections, groups and committees. At a special dinner meeting on Tuesday, January 20, there will be addresses by President Clarence L. Collens and an eminent speaker from outside the industry who will discuss current economic conditions.

A meeting of the board of governors is scheduled for January 20, the standards committee for January 22 and the casualty and fire prevention committee for January 23.

That portion of the industry devoted to electrical supplies will be particularly active in the meeting, though groups devoted to other products are also included in the program.

All of the meetings will be held at the association headquarters or the Hotel Commodore.

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New Pole Standards

NEW AMERICAN STANDARD VALUES for the strength of wood in the form of poles are announced by the American Standards Association, New York, as follows: Creosoted Southern pine, 7,400 lb.; chestnut, 6,000 lb.; Western red cedar, 5,600 lb., and Northern white cedar, 3,600 lb. per square inch.

Under the provisions of the National Electrical Safety Code the new values automatically replace the old figures of 6,500 lb. for dense yellow pine, chestnut and Western red cedar that have been in general use by pole line engineers. Northern white cedar remains unchanged.

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Power Truck Cranes

A POWER TRUCK CRANE in which the truck engine supplies power for all operations, including handling of the load line, raising and lowering of and swinging of the boom, is announced by the Silent Winch & Crane Company, Brooklyn, N. Y. This crane, designated Model Q-5, may be mounted back of the cab of the truck in less than 40 in. of space, the remainder of the truck being available for carrying the load.

The model Q-5 crane employs a winch with a built-in forward and reverse speed, so that both hoisting and lowering are by power under the control of a single lever. When this lever is in the neutral position a brake is automatically applied. Power is provided from a single power take-off and distributed to three worm-gear-driven units for the three power functions of the crane.

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Industry Leaders Weigh 1931's Problems and Opportunities

LEADERS of the electrical manufacturing industry look out upon 1931 with a reasonable degree of optimism for business improvement. Some tangible suggestions for improving the status of the industry were made in year-end statements given out.

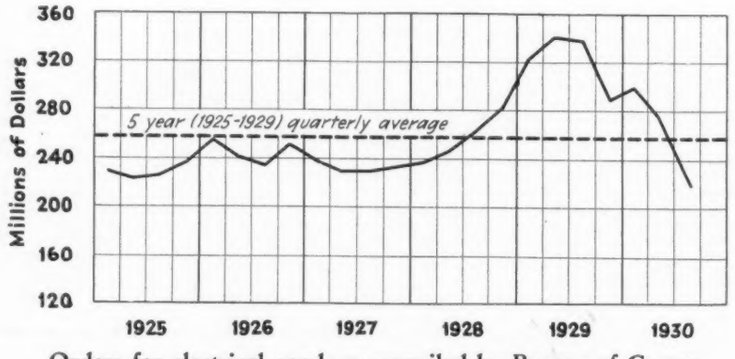
Clarence L. Collens, president of the National Electrical Manufacturers' Association, said: "I feel that the favorable factors of ample credit at low rates, depleted stocks, both of raw materials and finished products, and a very general liquidation in the prices of the industry's principal raw materials, cannot be without effect in bringing about recovery.

"I believe the freedom from uneconomic selling to be due in large measure to the increased volume of fact available to the industry from its statistical collection, and I am urging systematic and extended activity along these lines. I believe that stability is impossible without adequate statistics, and that if leveling of the extremes now existing in the business cycle, and consequent continuity of employment, is ever attained, it will be through comprehensive knowledge of the facts underlying the industrial operation. Under these conditions, I feel it to be almost the public duty of each individual business enterprise to contribute such fact to the industry of which it is a part as will promote this greater stability."

Referring to some of the developments of 1930 in the electrical industry, the January issue of the *General Electric Review* says:

"There were certain classes of electrical apparatus which resisted the general downward tendency, in comparison with the record activity of 1929, and in fact created new high figures for both the volume and the dollar value of production as compared with any previous year.

"In this group were included railway electric locomotives and electrical equipment for street railway and railroad motor cars, electric propulsion equipment for merchant ships, mercury-arc power rectifiers and high-tension cable. The number of installations of household type electric refrigerators also



Orders for electrical goods as compiled by Bureau of Census

showed a very substantial increase.

"Developmental work was continued actively throughout the year in the laboratory, the factory and in the field, with the result that improvements in design, materials and construction were secured in numerous classes of apparatus, all tending toward increased efficiency or economy in the generation, transformation, distribution and application of electric energy for power systems, transportation, communication, industrial modernization and in the rapidly growing field of farm electrification.

"Mercury-arc power rectifier installations increased both in number and capacity, the largest unit produced being rated 6,500 kw., 650 volts, 10,000 amp. It was designed for use in the production of electrolytic-hydrogen. One railroad applied power rectifiers in all of its substations as the sole source of the supply of energy to its feeder system. This was the first exclusive use of this apparatus for this class of service.

"Building construction utilized electric welding to a greater extent than heretofore and 84 cities and towns in the United States were added to the list of those permitting the use of this efficient and silent tool in place of the noisy riveter for this class of work."

Normal year anticipated

Discussing the outlook for the electrical industry, F. A. Merrick, president Westinghouse Electric & Manufacturing Company, said in part:

"While the short time outlook in the industry thus shows a much lower trend than has been the case in recent years, there are many aspects of the situation that promise improvement—the extension of electrical service to the farms of the country is progressing with increasing rapidly; there are important projects of electrification of transportation systems, some now under way and others approaching maturity; many of the important lines of industry are embracing this period of relatively slack business to rehabilitate their plants on the most modern, efficient basis, which generally means increased electrical equipment; all branches of government, federal, state and municipal, are joining in an effort to advance construction of useful public works, and even under present conditions there is ground for expectation that the use of electricity in the households of the country will be accelerated throughout the coming year, with attendant market for the appliances which will create this added use."

A. W. Robertson, chairman of the board of Westinghouse Electric & Manufacturing Company, sounded a constructively optimistic note in referring to the outlook. He said:

"Some time during 1931 there is every reason to expect a general improvement. The nation has all the raw materials of prosperity at hand—an abundance of low-priced commodities, ample funds, low inventories, and unsurpassed manufacturing and transportation facilities. According to present indications, the process of recovery will be more gradual than that of 1921, but since fundamental economic conditions are now much more satisfactory than they were immediately following the war, it is to be assumed that the resulting period of prosperity will be more enduring."

New Methods and Uses Widen Output Steadily

By GERARD SWOPE
President General Electric Company

IT IS always difficult to look ahead, and particularly so this year. We, in the electrical industry, possibly have had more to be thankful for during the past year than those in many other lines of endeavor, and this may also be true of what the future holds for us. New methods in industry, with electricity as their base, are being continually introduced; new uses are constantly being found for electrical apparatus and appliances in the home and new devices are being developed to meet these needs. The statistics of the electric light and power companies throughout the United States for 1930 reflect these tendencies, showing that there has been but a slight decline in the use of electric power by commercial organizations and in industry, and that the electric energy used in the home, even in this year of depression, has increased over last year.

We expect this course to continue, and therefore look forward with confidence, believing that the electrical manufacturing business, as a whole, in the new year should surely be no worse, and possibly somewhat better, than in the year 1930.

TRADE BRIEFS

Curtis Lighting, Inc., has announced the organization of Curtis Lighting of Canada, Ltd., with offices in Toronto.

Electric Service Supplies Company announces that R. S. Keeler has joined the sales department of this company with headquarters at Chicago.

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C. M. Bunnell has resigned as vice-president in charge of sales of the Armstrong Electric & Manufacturing Corporation to join Charles A. Davids, Inc.

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Census Shows 39 per Cent Gain in Electrical Products

Preliminary figures on the output of the electrical manufacturing industry in 1929 compiled by the Bureau of the Census show a gain of 39.2 per cent over totals for 1927, the previous census year. Totals by main classifications follow:

	1929	1927
Batteries, battery parts, and supplies	$145,207,574	*$146,693,521
Conduits and fittings	46,915,073	42,132,936
Control apparatus	42,451,032	*30,783,452
Fans, electric (including motors)	11,560,642	10,755,001
Electrotherapeutic and electromedical apparatus	19,957,011	16,149,405
Fuses	10,784,689	8,811,050
Fuse blocks	2,635,596	2,080,192
Generating apparatus and parts	68,131,815	*104,246,026
Ignition apparatus for internal-combustion engines	54,426,944	35,123,296
Industrial, commercial and domestic apparatus and appliances:		
Industrial and commercial	23,808,290	12,761,010
Domestic (household)	76,890,453	77,519,218
Instruments—measuring, relays, and instrument transformers	38,328,070	34,133,212
Lamps, incandescent-filament (not including sockets and other fittings)	$85,319,515	$87,933,244
Motors, except fan motors (not including starters or controllers)	185,233,201	*111,819,855
Radio tubes	79,720,807	22,163,102
Switchboards, circuit breakers and switches	79,424,219	71,924,341
Transformers, induction voltage regulators and current-limiting reactors (except radio and measuring-instrument transformers)	78,114,532	*66,266,216
Insulated wire and cable	296,858,831	210,047,947
Wiring devices	43,120,093	32,703,331
Miscellaneous	856,339,040	*556,187,574
Total value	$2,323,597,927	$1,668,104,965

*Revised.

Market Conditions

OVERSTOCK has been cut to bedrock on the Pacific. Prices are steady and the New Year is faced with optimism. Prospective power company business reaches large figures and extensive appliance sales campaigns are being planned. The East also is relatively enthusiastic over the outlook, although dullness still exists in many sections. Year-end business was more satisfactory than was anticipated.

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EASTERN

—THE YEAR *1931 opens in the Eastern district with some attractive prospects for sizable account for electrical equipment and it is generally expected that the early months of the New Year will show a definite trend to trade recovery. Year-end business was more satisfactory than anticipated, both from central station and industrial quarters, accompanied by an improved quota of inquiries. Motor account looks better than for several months past with the revival of activity in a group of basic industries, particularly iron and steel, chemical, textile and paper.*

—GOVERNMENT DEMAND *will be an important factor in the early weeks ahead and some heavy commitments for electrical equipment are being scheduled. Railroad business, dormant for the past 60 days, is another bright spot in the immediate situation.*

A New York central station has placed an order with a state manufacturer for transformers, network protectors and accessory apparatus to an amount of $70,000. A municipality in Iowa has awarded a contract for a generator and Diesel engine unit, the order for the latter going to a New York maker. Another New York manufacturer has secured an award for a motor-generator set, switchboard equipment, relays and auxiliary materials for a government reclamation project in Idaho. A power company has given an order to a state maker for a quantity of cable, totaling $70,000. The Dominion Engineering Works, Ltd., Montreal, has secured some exceptional orders for heavy machinery, comprising three 19,000-hp. turbine units for the West Kootenay Power & Light Company, four 38,000-hp. turbines for the Shawinigan Water & Power Company, and one similar unit of 34,000 hp. rating for the Gatineau Power Company.

Electric insulator business continues at a high level and all leading producers in that line are running on full production schedules. The Jeffery-Dewitt Insulator Company, Kenova, W. Va., has secured a contract for insulating equipment for the new Hoover Dam project, Grand Canyon, Arizona-California, totaling $150,000; an order has been received from the British government for a quantity of heavy-duty insulators amounting to $250,000, a considerable part of the shipment to be used in India. These and other incoming commitments assure capacity operations at this plant for at least six months to come.

The outlook for the iron and steel industry is encouraging. With contracts for rails and structural material now being received, and insuring higher mill schedules, improved demand is on the way for heavy-duty motors, controls and other electrical equipment. The Otis Steel Company, Cleveland, Ohio, has plans for a new continuous sheet mill to cost over $5,000,000. The Inland Steel Company is placing contracts for an addition to the hot strip mill at its Indiana Harbor, Ind., works, one award going to the Mesta Machine Company, Pittsburgh, for primary machines costing $4,000,000; electrical equipment will be an important feature of the new plant unit.

CONSTRUCTION PROJECTS

Department of Correction, Albany, N. Y., plans group of seven buildings at prison at Attica, N. Y., to cost over $500,000, and hospital and school building at reformatory at Elmira, N. Y., to cost $335,000. Singer Sewing Machine Company, New York, is reported planning plant at Pittsburgh, Pa., to cost over $150,000. Commanding Officer, Picatinny Arsenal, Dover, N. J., will receive bids until January 5 for panelboards, switches, wire and other electrical supplies (Circular 358). Board of Public Education, Philadelphia, Pa., will receive bids until January 6 for electrical supplies. American Steel & Wire Company, Donora, Pa., plans improvements in power plant. Wilmington General Hospital, Wilmington, Del., plans addition to cost over $250,000. Department of Commerce, Bureau of Standards, Washington, D. C., has plans under way for hydraulic laboratory to cost $350,000.

SOUTHWEST

—THERE HAS BEEN NO CHANGE *in conditions during the past week. None of the large manufacturers has closed a contract of any size.*

A very small volume of stock sizes has been moved, but this is normal for a holiday week. Two fair-sized contracts are to be closed in the next few days. The consensus of opinion is that no change for the better can be expected until after the middle of January.

CONSTRUCTION PROJECTS

Empire District Electric Company, Joplin, Mo., has approved plans for transmission line, including power substations to cost over $150,000. Sonken Galamba Corporation, 46 North Second Street, Kansas City, Mo., is in the market for hydro-turbine units. Galveston, Tex., plans airport with lighting system, etc., reported to cost over $100,000. Louisiana Power & Light Company, Algiers, La., plans transmission line with power substations to cost over $70,000.

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SOUTHEAST

—AS FUNDS IN NEW BUDGETS *become available inquiries increase and indications point to a reasonably satisfactory activity in electrical circles for the next 30 days at least. Despite lower prices, the leading jobbers' holiday business was equal to that of last year, reflecting the satisfactory retail activity.*

A Louisiana power company ordered circuit breaker equipment amounting to $15,000 and a Georgia company purchased weatherproof wire and pole line hardware totaling $14,800. Another order from Louisiana was for $10,000 worth of power transformers, while two switchboard orders placed by a Georgia central station aggregated $6,600. A Tennessee company ordered 40,000 lb. of bare copper and a North Carolina central station placed three orders aggregating one carload of "Hitenso" wire. Some other power company orders were for $2,950 worth of guy strand and $2,400 worth of distribution transformers. A Tennessee rayon plant ordered $75,000 worth of micarta buckets, while another rayon plant in the same state placed an order for $5,000 worth of motor equipment.

CONSTRUCTION PROJECTS

University of Virginia, University, Va., has plans for chemical laboratory addition to cost $100,000. Construction Quartermaster, Fort Monroe, Va., will receive bids until January 20 for parachute building and other structures at Langley Field. Tennessee Electric Power Company, Jamestown, Tenn., contemplates improvements in power plant.

PACIFIC COAST

—PACIFIC COAST ELECTRICAL INDUSTRY *is facing 1931 in a fine state of preparedness and with no illusions over the kind of business to be encountered. Collections are even better than a year ago, averaging 44 days; organizations have been pruned, so far as is consistent with efficiency; overstock and dead stocks have been cut to a minimum and the annual stock inventories held this week are reported by wholesalers as satisfactory.*

—PRICES ARE *remarkably steady and the price structure has held up well all year despite a few adjustments due to hand-to-mouth buying.*

Analyzing prospective business, power company budgets for California total about $75,000,000, of which about 10 per cent, largely machinery, is to be placed very soon. Extensive co-operative sales campaigns between power companies and dealers are also planned. Government business continues its extensive plans, including the Sunnyvale dirigible base, $3,000,000 for veterans' hospitals, and especially the gigantic Boulder Dam project centering around Las Vegas, Nev., where immediate construction camp expenditures of $1,000,000 and $2,000,000 for municipal improvements are to be made. The California state program of approximately $10,000,000 for state institution construction and betterments is now under way, in widely scattered districts. Railroad business is expected to be fair, with considerable cable and signal work laid out and prospective large business because of the Great Northern entrance into California.

Orders given and prospective business include a carload each of pole steps and angle braces for Los Angeles, a $46,000 award to the General Electric Company for a 2,000-kva. turbo-alternator unit for Mare Island navy yard, a $7,000 police radio installation for San Francisco and $10,000 street-lighting jobs for San Leandro, Livermore and Porterville. Transformer business has been particularly good, General Electric reporting sales of $60,000 in the Hollister district and four of 2,000 kva. valued at $35,000 for Campbell. Westinghouse reports a $45,000 order for Seattle and three of 5,000 kva. valued at $115,000 for Los Angeles.

Negligible sales and inquiries were reported by jobbers in Seattle and Puget Sound districts last week, the Seattle volume including a few distribution transformers, a small amount of miscellaneous switchgear, one 150-hp. motor to a sawmill, fifteen machines to mills and allied industrials for replacements and about twenty small machines to dealers and scattered sources. Seattle Board of Public Works desires bids until January 16 for furnishing transmission line conductor and accessories for Diablo-Seattle line, costing about $800,000. The line is designed to carry 150,000 kva. at 220 kv., 60 cycle, three phase. About the Middle of January the Board of Public Works will call for bids for automatic switching equipment involving two complete switchboards for Lake Union steam auxiliary and North End substation, costing about $50,000, also for 48 subway transformers, ranging from 200 to 300 kva., costing about $45,000.

CONSTRUCTION PROJECTS

California Public Service Corporation, Alturas, Calif., plans extensions in transmission lines at Eagleville and other points in Modoc County, to cost over $200,000. Southern California Edison Company, Los Angeles, plans power substation at Costa Mesa, to cost $100,000. Redwood Manufacturing Company, Pittsburg, Calif., plans power plant to cost over $50,000. Western Pacific Railroad and Great Northern Railroad, Oakland, Calif., plan joint terminal buildings on waterfront to cost $3,000,000. Twin Harbors Electric Company, Aberdeen, Wash., has approved plans for a 30-mile transmission line to cost about $70,000. Bureau of Reclamation, Denver, Colo., will receive bids until March 4 for construction of Hoover Dam, power plant and auxiliary works, Boulder Canyon project, Arizona-California-Nevada (Specification 519).

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NEW ENGLAND

—LITTLE ACTIVITY *is reported in heavy electrical machinery. Small motor orders, according to one manufacturer, were received at a slower pace than the previous week and switch and control equipment attracted little attention.*

Interest in power-control equipment is now centered in several large orders for outside station expansion work which will amount to about $200,000 and which will be awarded soon. Industrial electric heating equipment is somewhat spotty, one manufacturer reporting little activity in the larger type of heat-treating furnaces. On the other hand, one manufacturer whose furnaces are adapted for the non-ferrous metals trades reports a very encouraging interest in and demand for small continuous furnaces. A seasonal demand in merchandising is reported by one group of central stations, somewhat below that of last year. Electric clock sales and radios mark the most striking gain in electrical equipment.

CONSTRUCTION PROJECTS

Edison Electric Illuminating Company, Boston, Mass., has completed plans for power plant addition on Kneeland Street, to cost $1,000,000. Massachusetts Institute of Technology, Cambridge, Mass., has filed plans for two laboratory additions to cost $700,000. Turners Falls Power & Electric Company, Turners Falls, Mass., plans addition to local power plant and construction of steel tower transmission line to cost $500,000. Yale University, New Haven, Conn., has authorized group of six buildings for graduate school to cost $2,400,000. New England Telephone & Telegraph Company has announced plans for expending $27,000,000 during 1931.

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MIDDLE WEST

—NOT MUCH CHANGE *in general business is noticeable this week in the Middle West section. Some slowing up of general activity is apparent as the close of the year approaches. A considerable number of industries are taking this opportunity to pause and consider operations for the coming year.*

—AN INDESCRIBABLE AIR *of relief seems apparent as the year draws to a close and the general feeling seems to be that business will probably pick up after the turn of the year.*

More favorable indications of a return of normal business are being noted in the major industries. More confidence in future business is being exhibited. Retail trade held up well up to the holidays and it is expected that the figures for the holiday season will be comparable with other years. The various utility companies are conservatively proceeding with their construction and line extension programs scheduling a considerable amount of additions to substations, extensions of service and circuit revision work in the first part of the coming year. There has been an increase in the number of inquiries for apparatus.

CONSTRUCTION PROJECTS

Detroit Public Lighting Commission, Detroit, Mich., is arranging a fund of $1,000,000, for extensions and improvements in power substations. Central Public Service Corporation, Houghton, Mich., contemplates transmission line from Houghton to Hersley Rapids, reported to cost over $75,000. Greenville Electric Light & Power Company, Greenville, Ohio, contemplates extensions in transmission lines and power substation facilities. Northwestern Public Service Company, Huron, S. D., plans transmission line in vicinity of Willow Lake, to Bancroft. State Department of Mines, St. Paul, Minn., contemplates laboratory at Hibbing, Minn., to cost $75,000. Newens-Northland Milk Company, East Des Moines, Iowa, plans plant addition to cost close to $60,000. Iowa Public Service Company, Sioux City, Iowa, plans extensions in transmission lines in Audubon County. Iowa Southern Utilities Company, Centerville, Iowa, has plans for extensions in transmission lines in Union County, reported to cost over $50,000.

Directory of Electrical Associations

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, M. E. McIver, 8 South Michigan Ave., Chicago, Ill.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. General secretary, Guy C. Hecker, 292 Madison Ave., New York City.

AMERICAN ENGINEERING COUNCIL. Executive secretary, L. W. Wallace, 744 Jackson Place, Washington, D. C.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, INC. Secretary, P. W. Henry, 75 West St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. National secretary, F. L. Hutchinson, 33 West 39th St., New York City. Board of directors meets bimonthly. Sections and branches meet monthly in the principal electrical centers throughout the country. Three national and several district conventions held each year.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, C. W. Rice, 29 West 39th St., New York.

AMERICAN STANDARDS ASSOCIATION. Secretary, P. G. Agnew, 29 West 39th St., New York City.

AMERICAN WELDING SOCIETY. Secretary, M. M. Kelly, 29 West 39th St., New York.

ARIZONA UTILITIES ASSOCIATION. Executive secretary, J. S. Arnold, Central Arizona Light & Power Co., Phoenix, Ariz.

ARKANSAS UTILITIES ASSOCIATION. Secretary-treasurer, R. I. Brown, Arkansas Power & Light Co., Little Rock, Ark.

ARTISTIC LIGHTING EQUIPMENT ASSOCIATION. Managing director, C. L. Benjamin, 420 Lexington Ave., New York City.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Preston S. Millar, 80th St. and East End Ave., New York.

ASSOCIATION OF ELECTRAGISTS INTERNATIONAL. Secretary, Laurence W. Davis, 420 Lexington Ave., New York City. Direct membership and membership through chartered local chapters throughout the United States and Canada.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Managing director, John F. Kelly, Empire Bldg., Pittsburgh, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Room 411, C. & N. W. Terminal Station, Chicago, Ill.

CANADIAN ELECTRICAL ASSOCIATION (affiliated with N.E.L.A.). Secretary, H. M. Lyster, 407 Power Bldg., Montreal.

CANADIAN ENGINEERING STANDARDS ASSOCIATION. 46 Elgin St., Ottawa, Ont.

COLORADO UTILITIES ASSOCIATION. Now a part of Rocky Mountain Geographic Division, N.E.L.A.

EAST CENTRAL GEOGRAPHIC DIVISION, N.E.L.A. Secretary, D. L. Gaskill, 603 Broadway, Greenville, Ohio.

EASTERN GEOGRAPHIC DIVISION, N.E.L.A. Secretary-treasurer, Harold A. Buch, Telegraph Building, Harrisburg, Pa. Managing director, A. B. Millar.

ELECTRIC ASSOCIATION (THE) (Chicago). Manager, Ralph S. Steffens, 20 North Wacker Drive, Chicago, Ill.

ELECTRICAL ASSOCIATION OF NEW YORK, INC. Secretary, John L. Owen, 250 Fourth Avenue, New York.

ELECTRICAL LEAGUE OF COLORADO, Manager, George Bakewell, Jr., Gas & Electric Bldg., Denver, Colo.

ELECTRICAL LEAGUE OF UTAH. Executive secretary, R. E. Folland, Newhouse Hotel, Salt Lake City, Utah.

ELECTROCHEMICAL SOCIETY, INC. (THE), Secretary, Colin G. Fink, Columbia University, New York City.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, Grand Central Terminal, New York City.

FLORIDA ENGINEERING SOCIETY. Secretary, W. W. Fineren, Gainesville, Fla.

GEORGIA ELECTRICAL ASSOCIATION. Secretary-treasurer, J. J. McDonough, Georgia Power Co., Augusta, Ga.

GREAT LAKES GEOGRAPHIC DIVISION, N.E.L.A. Secretary-treasurer. T. C. Polk, 20 North Wacker Drive, Chicago.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary-treasurer, George. W. Schwaner, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, E. H. Hobbie, 29 West 39th St., New York City.

ILLUMINATING GLASSWARE GUILD. Assistant business manager, C. H. Ferris, Stevenson Corp., 19 West 44th St., New York City.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Vera Cox, 1548 Consolidated Building, Indianapolis, Ind.

INSTITUTE OF RADIO ENGINEERS. Secretary, Harold P. Westman, 33 West 39th St., New York City.

INTERNATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Victor H. Tousley, 612 North Michigan Ave., Chicago. Eastern, Western, Southwestern, Northwestern and Southern Sections.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, Secretary, W. H. Harth, Columbia, S. C.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body formed of 26 national electrotechnical committees). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

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KANSAS SECTION, N.E.L.A. Secretary, Mrs. Lillian M. Jacoby, Kansas Gas & Electric Co., Wichita, Kan.

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MICHIGAN ELECTRIC LIGHT ASSOCIATION. Secretary, Herbert Silvester, 401 South Street, Ann Arbor, Mich.

MIDDLE WEST GEOGRAPHIC DIVISION, N.E.L.A. Secretary-treasurer, Thorne Browne, 1527 Sharp Bldg., Lincoln, Neb.

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NATIONAL COMMITTEE ON THE RELATION OF ELECTRICITY TO AGRICULTURE. Director, E. A. White, 1120 Garland Bldg., Chicago.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Managing director, Paul S. Clapp, 420 Lexington Avenue, New York City.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1008 Marquette Building, Chicago, Ill. Central, New England, New York and Middle and Southern Atlantic States Divisions.

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NATIONAL ELECTRICAL WHOLESALERS' ASSOCIATION. Managing director, E. Donald Tolles, 165 Broadway, New York City. Pacific Coast Division: Secretary, Albert H. Elliot, 502 Flatiron Bldg., San Francisco.

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NEBRASKA SECTION, N.E.L.A. Secretary-treasurer, Thorne Browne, 1527 Sharp Building, Lincoln, Neb.

NEW ENGLAND GEOGRAPHIC DIVISION, N.E.L.A. Secretary, Miss O. A. Bursiel, Statler Building, 20 Providence St., Boston, Mass.

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NEW YORK ELECTRICAL SOCIETY. Secretary, Frederic M. Delano, 29 West 39th St., New York City.

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NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION (Geographic Division N.E.L.A.). Secretary, Berkeley Snow, 1206 Spalding Building, Portland, Ore.

OKLAHOMA UTILITIES ASSOCIATION. Manager, E. F. McKay, 1020 Petroleum Building, Oklahoma City, Okla.

PACIFIC COAST ELECTRICAL ASSOCIATION (Geographic Division N.E.L.A.). Managing Director, K. I. Dasex, Room 630, 447 Sutter St., San Francisco, Calif.

PENNSYLVANIA ELECTRIC ASSOCIATION. Managing director, A. B. Millar; secretary-treasurer, Harold A. Buch, Telegraph Bldg., Harrisburg, Pa.

PUBLIC UTILITIES ASSOCIATION OF VIRGINIA. President T. Justin Moore, Virginia Electric & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, A. Bliss McCrum, P.O. box 1483, Charleston, W. Va.

ROCKY MOUNTAIN GEOGRAPHIC DIVISION, N.E.L.A. Secretary, and managing director, George E. Lewis, 367 Gas and Electric Bldg., Denver, Col.

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